UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
Bureau of Plant Industry, Soils, and Agricultural Engineering

THE NATIONAL POTATO-BREEDING PROGRAM
1949

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By

Division of Fruit and Vegetable Crops and Diseases
and
the State Cooperators

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(20th Annual Report to Cooperators)

Plant Industry Station
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NATIONAL POTATO-BREEDING PROGRAM, 1949

By F. J. Stevenson

The 1949 report contains the usual array of tests for the various horticultural characters, such as yield, market quality, and dry matter of tubers as measured by specific gravity. In some States growing conditions were poor, and the results for some varieties were disappointing, whereas in other tests the same varieties were surprisingly good.

Specific gravity, as a rule, was low for all sections of the country. Some of the factors that might be suggested for such a condition are hot weather at the time of tuber development; heavier applications of fertilizer; use of DDT, which keeps the plants in a green condition longer; and in some places, such as Maine, an early killing frost (September 10).

Besides the economic phases of the potato-breeding program, the reports this year include in a number of instances the results of basic research, which will be most helpful to various workers in the field.

Late Blight

Excellent progress is indicated in the breeding for resistance to late blight. A few years ago only two or three workers were interested in this problem. Today there is a growing interest in every potato-growing section for blight-resistant varieties.

About 20 years ago the Federal workers attempted to combine the genes for resistance found in some of the susceptible varieties or intermediate types of resistance, such as is found in several European varieties; for example, Ackersegen or President. Using the genes found in these, Sebago, Calrose, and Saranac were produced all showing a degree of resistance to the common physiologic races of the blight organisms. In 1934 we received from Dr. K. O. Müller, now of Cambridge, England, but at that time working in Berlin-Dahlem, Germany, seed of his W races. He indicated that the W races carried genes for the immunity to the A forms of late blight but not to the S forms. We were able to combine these genes with those conditioning the other economic characters and produced Kennebec and numerous relatives. We were not surprised, as some of our co-workers seemed to be, when Kennebec was attacked by the more virulent races. We had been forewarned by Dr. Müller. However, we did reach our objective. We combined the resistance found in the W races with high yield and high market and cooking quality in sections to which Kennebec and other selections are adapted. In the meantime, Dr. Reddick had set out to combine the immunity of some varieties of Solanum demissum with other

characters of economic importance. After many years of research he found that the immunity is not transferred as a unit but that several factors are involved. The reports of Reddick and Peterson of Cornell University and of Mills, State College, Pa., who works very closely with Reddick and Peterson, give the latest picture of the late-blight research. As Mills states: "Three distinct genes for resistance have been identified among the descendants of Solanum demissum. Intercrossing of plants carrying different genes will produce immunity to all races of the fungus, which have been isolated from the field." The problem of the potato breeder is to recombine the genes that have segregated out of the demissum immunity. The recent crosses at both State College, Pa., and at Cornell University have been made with this objective. In the recent Federal work the most promising crosses have been made between some of those related to the W races, carrying immunity to the common forms, and one of Dr. Reddick's seedlings, TI 5. We have some seedlings that have not become infected with any of the races, which Dr. Schultz has collected in the blight-resistant test plots in Maine. A number of these have commercial promise. Three of them will be included in the yield test in 1950. Two of the latter are early; the other medium early.

The research work reported from Minnesota is adding to our knowledge of the problem, as a whole. Peterson and Hooker at Iowa State and Dykstra at the University of Louisiana are testing many seedlings for their reaction to late blight.

Scab

Again, as in past years, many people are breeding potatoes for scab resistance or testing available selections for adaptability. Late scab-resistant sorts have not been too difficult to produce, but the breeding of early, high-yielding varieties with good market and cooking quality is a more difficult task. This is not because our people have not tried every technique known to plant breeders but because of the complex genetic system we are compelled to work with. Scab resistance of itself is not so difficult but to combine it with other complex characters is another matter. In spite of the difficulties, some progress is being made, as can be seen by a number of the reports.

Verticillium Wilt

Read John McLean's report from Aberdeen, Idaho, for an evaluation of the importance of this disease to the Idaho growers. Dr. McLean has been in Aberdeen for just one growing season, but he has grown a large number of varieties and seedlings under conditions that cause heavy losses in the Russet Burbank variety. These first tests have indicated that some varieties show a worth-while degree of resistance. The epidemic was so uniform in the plots that it can be assumed that the results for only one year are fairly reliable. Another test for

resistance to verticillium was made in California. Nearly everything was attacked by the disease in this test. Two foreign varieties and two U.S.D.A. seedlings seemed to escape infection. See the California report by Glen N. Davis.

Ring Rot

The reports of Reiner Bonde from Maine and Riedl, et al. from Wyoming are interesting. Bonde shows the wide differences in ring-rot reaction among progenies. Riedl et al. tested inoculum from resistant and susceptible varieties but were not able to demonstrate any differences in virulence.

Hopperburn and Flea Beetle Injury

Dr. J. P. Sleesman increased his work for resistance to injury by leafhoppers and flea beetles. Some of the most resistant seedlings are related to Sequoia; others are related to B 294-38. The latter is a variety that showed some resistance to aphid injury in tests in New Brunswick, Canada. It would simplify the work of breeding if a single character for resistance to a number of insects could be found.

Virus Diseases

Immunity in the field to virus A is quite common in our breeding stocks, and it is the writer's opinion that no new variety should be distributed to growers that does not show this immunity.

Immunity to virus X in grafts and field is also easy to obtain. In the work at Presque Isle, Maine, we have a number of graft-immunes that show commercial promise. These also have the field immunity to A.

Resistance to virus Y is almost an unknown quantity. Some varieties, such as Chippewa and Katahdin, show a degree of resistance under ordinary field conditions. But read Dr. Schultz's report on the tests he made in Maine in 1949. The resistance almost disappeared. Research work such as is reported by Timian from North Dakota will contribute greatly to the solution of the Y virus problem.

We have recently received from Dr. William Black, Edinburgh, Scotland, four varieties that are supposed to be field immune to virus Y. We received only a few tubers from quarantine and will have none for distribution until we have had time to increase them. (See P.I. table 6).

Leaf Roll

As Dr. Black has said, leaf roll resistance is a "sticky" problem, but this report shows progress. One of the difficulties involved is brought out in Dr. Folsom's Maine report. His report gives some of the results obtained with the field tests at Highmoor Farm. The report by Simpson and Bonde gives a summary of the results obtained with viruliferous aphids. In each case it is apparent that progress is being made.

Leaf roll is an important problem in the Pacific Northwest. Locke's report from Washington indicates a heavy annual spread at three different locations. The high-quality Netted Gem showed the greatest average leaf roll pickup (46.2%), with a maximum pickup of 57.8% at Prosser. A few varieties showed a degree of resistance. In the report from J. D. Menzies, Prosser, Wash., it is indicated that resistance to leaf roll is an elusive character. There is very little of it in any of the breeding lines.

A few of our recently named varieties show a degree of resistance, such as Essex, Katahdin, Houma, Calrose, and a selection from a cross of Houma x Katahdin 1276-185.

Some of the introductions from Europe show enough field resistance to prevent their becoming heavily infected for a number of years. Among them could be named Ackersegen, Triumf, and Aquilo.

Net Necrosis

It is stated in the report from Menzies that net necrosis resistance occurs in a much greater proportion of clones than does leaf roll resistance. The chances for success in this more limited objective should be correspondingly greater. Net necrosis is the major problem as far as leaf roll is concerned with the commercial late-potato grower in eastern Washington. The same can be said for those who are trying to grow Green Mountain in Maine. Applying DDT to kill the aphid vectors was supposed to prevent this disease, but there was considerable net necrosis in Green Mountain in some of our plots in Maine in 1949 despite careful spraying with DDT. Perhaps Parathion may prevent the malady.

PLANT INDUSTRY STATION (Beltsville, Md.) and
CHAPMAN AND AROOSTOOK FARMS (Presque Isle, Maine)

By F. J. Stevenson, R. V. Akeley, and E. S. Schultz

Plant Industry Station

The potato-breeding work at the Plant Industry Station consisted as usual in distributing potato seed, varieties, and seedlings to cooperating State agricultural experiment stations and to foreign countries; producing seed of new crosses and selfed lines; growing seedlings in the greenhouse; testing seedlings for immunity from virus X; and testing others for resistance to various physiologic races of Phytophthora infestans. Data and reports of various kinds were assembled and analyzed, and an annual report was prepared and distributed to all cooperating agencies and to a few others who are particularly interested in the project.

Seed Production

In the late winter and early spring of 1949 conditions for seed production in the greenhouse at Beltsville, Md., were again very favorable. All varieties and seedlings that produced seed balls in Maine by open-pollination gave an abundance of viable pollen here. A number of special techniques were used in an attempt to get species hybrids, some of which insofar as we know have not been obtained, and others that have been produced rarely. These same techniques were used also on a few numbered varieties that have persisted in dropping their buds before they open and on several others that flower but are pollen-sterile.

Grafting onto tomato plants was tried, but this method is not a panacea for all ailments. In certain varieties, such as Sebago which sometimes produces selfed seed when hand-pollinated, a slight increase of seed was produced on the grafted plants. In a variety such as 41956, which flowers readily but which rarely if ever produces viable pollen, no improvement in the quality of the pollen was found on the grafted plants. Three seedling varieties that have never produced flowers in the greenhouse at Beltsville dropped their buds, even when grafted onto tomato plants. Grafting was seemingly no help in the production of species hybrids. Girdling of the plants was tried but with no effect as far as seed-setting was concerned.

Growth substances were used with varying results. In some cases if the hormone was applied before the bud opened the pedicel enlarged and the bud persisted for several days but did not open. In a few cases in which the flower opens but drops off before fertilization has time to take place, the hormone favored fruit production but in many instances the fruit was parthenocarpic. A few seeds were obtained but whether or not they are the result of cross-pollination has not yet been

ascertained. Some of these techniques and a number of new ones will be used in 1950 in an attempt to learn more about the problems of seed setting under the conditions found at the Plant Industry Station.

The best technique so far adopted is to select the self-fertile varieties and seedlings in the field. Parents are selected on the basis of horticultural characters, such as yield and market quality, and also for their resistance to the diseases for which they were bred. But it goes without saying that if two selections, one self-fertile and the other self-sterile, are equally good, the self-fertile is used as the parent for future work. We now have fertile varieties immune from mild mosaic in the field, immune from virus X; resistant to a certain degree to virus Y; resistant to leaf roll; immune from net necrosis; and resistant to scab, late blight, ring rot, and hopperburn. Nearly all combinations of crosses have been made between them. An abundance of seed was obtained in 1949.

New Seedlings

The 1949 seedling potato crop at the Plant Industry Station consisted of about 55,000 seedlings grown in 3-inch pots. As usual, some of these produced no tubers, or such small ones that they were considered worthless. The tubers of others were discarded because of poor shape or tuber color.

Where studies are to be made of whole progenies none of the seedlings is discarded, but if the objective is to produce commercial varieties many seedlings can be discarded immediately because of poor shape and color.

Distribution

The distributions of seed, new seedlings, and named and numbered varieties are given in P.I. tables 1 to 4. The seed and new seedlings that are distributed are produced for the most part at the Plant Industry Station. The named and numbered varieties are grown on the Chapman or Aroostook Farms, Presque Isle, Maine, and either sent to Beltsville for distribution or distributed directly. The distribution as shown by the lists of seed and seed stocks in tables 1 to 4 was the most extensive in the history of the National Potato-Breeding Program.

Foreign Introductions

A number of varieties and species of potatoes were introduced from foreign countries, grown in quarantine, and released to the potato-breeding project. P.I. table 5 gives a list of those received early enough to be increased on the Aroostook Farm, Presque Isle, Maine, in 1949. Most of these produced tubers but a few, as indicated in the table, did not. A few others were so full of mosaic they had to be discarded.

P.I. table 1. Distribution of potato seed to foreign countries and to State experiment stations in 1949.

Country or State Station	Cooperator	Pedigrees
		No.
Belgium	N. Rigot	11
Germany	Dr. von Kameke	13
"	Dr. Wilhelm Rudorf	9
Hungary	Eugen Eszenyi	6
Japan	K. Kawkami	13
South Africa	A. L. Hagedoorn	13
Idaho	John G. McLean	20
Louisiana	T. P. Dykstra	30
Michigan	E. J. Wheeler	30
North Carolina	L. W. Nielsen	5
" "	Fred D. Cochran	80
North Dakota	Harold Mattson	30
Virginia	M. M. Parker	14
Washington	Martin W. Carstens	53

P.I. table 2. Distribution of new seedlings from greenhouse at Beltsville, Md., in 1949.

Station	Cooperator	Progenies	Seedlings	Kind of test -- resistance to
		No.	No.	
Idaho	John G. McLean	25	2,194	Adaptation and verticillium wilt.
Maine	Reiner Bonde	12	2,499	Ring rot.
Maine	G. W. Simpson	36	5,780	Leaf roll.
Maine	Robert V. Akeley	103	25,422	Viruses A, X, Y, net necrosis, scab, blight, ring rot.
Minnesota	O. C. Turnquist	48	7,372	Adaptation, etc.
North Carolina	Fred Cochran	33	4,117	Brown rot, etc.
Ohio	J. P. Sleesman	26	3,850	Hopperburn, etc.
Virginia	M. M. Parker	15	1,855	Blight, earliness, etc.
W. Virginia	K. C. Westover	8	1,149	Adaptation, etc.

P. I. table 3. Distribution of named and numbered varieties of potatoes to foreign countries.

Country	Cooperator	Named or numbered varieties
		No.
Australia	Cedric Vears	1
Belgium	N. Rigot	31
China	H. T. Yang	12
China	Mrs. Lewis Maine	3
Costa Rica	Ernest H. Sacceres	24
Cuba	Manuel A. Tamargo	1
Ecuador	Antonio Garcia	28
El Salvador	R. G. Reeves	24
England	R. S. Hudson	10
France	Pierre Chouard	29
France	Ernest Tourneur	11
Germany	Gerhard Wandel	27
Germany	Wilhelm Rudorf	31
Greece	Th. Petrovas	14
Greece	N. Christodonlou	10
Netherlands	H. J. Van Kretchmar	25
New Zealand	Arthur Sainsbury	1
Norway	Mr. Eikland	14
South India	S. T. Arokiasawmy	20
Sweden	George Borgstrom	24
Venezuela	J. H. Standen	25

P.I. table 4. Distribution of named and numbered varieties to States and territories.

State	Cooperator	Named or numbered varieties
		No.
Alaska	Art. Thompson	1
Alaska	M. F. Babb	47
Alabama	Ben Connor	1
Arizona	Z. M. Fineman	21
Arizona	Joseph Hamilton	12
California	Glen Davis	149
California	H. G. Zuckerman	1
Canada	N. M. Parks	1
Canada	Germain Bourassa	1
Canada	G. P. McRostie	7
Canada	G. E. B. Fuller	1
Canada	E. M. Taylor	1
Canada	Mr. Dionne	5
Canada	Mr. Cunningham	9
Colorado	W. C. Edmundson	101
Connecticut	Arthur Hawkins	7
Florida	A. H. Eddins	11
Florida	David L. Stoddard	10
Florida	J. C. Hoffman	9
Idaho	John G. McLean	316
Idaho	J. M. Raeder	1

State	Cooperator	Named or numbered varieties No.
Indiana	N. K. Ellis	96
Iowa	C. E. Peterson	110
Kansas	Claude E. King	6
Louisiana	T. P. Dykstra	54
Maryland	R. A. Jehle	1
Massachusetts	W. H. Dunlap	16
Minnesota	O. C. Turnquist	138
Minnesota	F. A. Krantz	67
Michigan	J. H. Muncie	86
Montana	M. M. Afanasiev	19
Nebraska	H. O. Werner	104
North Carolina	L. W. Nielsen	5
" "	Fred Cochran	21
North Dakota	Harold Mattson	119
" "	W. G. Hoyman	72
New Hampshire	Paul T. Blood	4
New Jersey	John C. Campbell	6
" "	Paul B. Mott	1
New York	J. R. Livermore	21
" "	L. C. Peterson	53
" "	W. F. Mai	7
" "	Arthur J. Pratt	1
" "	E. V. Hardenburg	11
Ohio	J. P. Sleesman	9
Ohio	Harold Chambers	1
Oregon	Roy A. Young	42
"	C. A. Henderson	3
"	A. E. Gross	1
Pennsylvania	R. E. Hartman	26
"	J. S. Cobb	19
Rhode Island	T. E. Odland	15
South Carolina	William Epps	19
Tennessee	J. J. Bird	1
Texas	E. A. Spacek	1
Utah	Glenn T. Baird	1
Virginia	Flood S. Andrews	5
"	M. M. Parker	26
Washington	Martin W. Carstens	47
"	Avery Rich	2
Wisconsin	G. H. Rieman	154
"	Jim Weber	1
Total		2,103

P.I. table 5. Foreign introductions released from quarantine spring of 1948 and in 1949.

Potato section accession No.	Variety	Country from which received	Harvest notes
25693-25743	46 varieties of S. tuberosum	Brazil	Saved
25744	Stewart Dawn	Ireland	"
25745	Puca-Muru Miskkilla	Peru	No tubers
25746	Yuracc-Miskkilla	"	"
25747	Huaccoto	"	"
25748	Aracc-Papa	"	"
25749	Wild potato	Argentine	"
25750	Grummel P 299	Holland	Saved
25751	Sirtema	"	"
25752	Meerlander	"	"
25753	Aspolet	"	"
25755	D.S. x A.S. Plant 737	Norway	25% mosaic
25756	D.S. x A.S. Plant 1006	"	37% "
25757	Fossing	"	Saved
25758	Forsbadpolef	"	86% saved
25763	Prestkvern	"	11% "
25765	Saga	"	Saved
25768	Trumume Keiserkrone	"	80% saved
25833	Kerkov Kidney	Czechoslovakia	Received Oct.1949
25834	Kerkov Krasava	"	" "
25835	Kerkov Roll	"	" "
24836	Kerkov Triumf	"	" "

Perhaps the most interesting group of foreign introductions from the breeding standpoint are the varieties recently received from Dr. W. Black, Craigs House, Corstorphine, Edinburgh, Scotland. These were released October 17, 1949. Each lot of tubers was divided. One lot of tubers of each was sent to Dr. Robert Hougas who has charge of the new gene-maintenance station in Wisconsin; the other lots were retained at Beltsville to be used as parents of hybrids.

P.I. table 6 gives a list of these with the genetic characters they are supposed to possess.

Seed of a number of species and species hybrids was received from Dr. Wilhelm Rudorf of the Kaiser Wilhelm Institute in Germany. Some of the hybrids were supposed to be related to Solanum polyadenium. The seed lots were divided three ways: One lot was sent to Dr. Donald Reddick of Cornell University; one to Dr. Robert Hougas in Wisconsin; and one retained at the Plant Industry Station. The lots retained here have been grown in the greenhouse. As this report is written some variation can be seen between the plants in the various lots, but the expected segregations are

P. I. table 6. Varieties and seedlings received from W. Black, Craigs House, Corstorphine, Edinburgh, Scotland

Accession No.	Variety	Breeding	Resistance to:
25824	Craigs Snow White	Bred from S. demissum	Blight races A & C, and field-immune from viruses A, B. C, & X.
25825	1439-a (4)	Bred from S. demissum x S. rybinii.	Blight races A, B, & C. Appears resistant to leaf roll.
25826	1253-a (12)	do	Blight races A, B, C. Field-immune from viruses A & X.
25827	Craigs Royal	Craigs Defiance x Gladstone	Field-immune from viruses A and X.
25828	1611-a(13)	Australian Seedling x blight-res. seedling	Blight races A, B, & C. Field-immune from virus Y.
25829	1531-(3)	(F_1 of S. simplicifolium x S. rybinii) x blight-resistant seedling	Field-immune from virus Y
25830	1542-(2)	Australian seedling x Gladstone	Field-immune from virus Y
25831	834-c(29)	Bred from S. demissum	Blight races A & C. Field-immune from viruses A,B,C, & X.
25832	1611-a(15)	Australian Seedling x blight-resistant seedling	Blight races A,B,C. Field-immune from virus Y.

not in evidence. In none of the hybrids supposed to be related to Solanum polyadenium can the potent odor of this species be found.

Chapman Farm, Maine

Twenty-nine named and numbered varieties were increased on the Chapman Farm in 1949. In addition, about 2,235 seedlings were grown in 10-hill rows and single hills of about 24,129 first-year seedlings were planted. The first-year seedlings had been grown to maturity in the greenhouse at Beltsville, Md., in the fall of 1948. Of the tubers 97.6% germinated. This was slightly higher than the 96.2% which germinated in 1948. About 9.1% of the seedlings grown were selected to be grown in the various tests in 1950.

Maturity and fertility data were taken on selections in the 10-hill rows. The data for these characters are given in P.I. table 7.

P.I. table 7. Maturity and fertility data on the seedling varieties grown in 10-hill or multiple 10-hill rows at Chapman Farm, Presque Isle, Maine, in 1949.

Maturity classes	Seedlings		Fertility	Seedlings	
	No.	Pct.	Classes	No.	Pct.
Very early	118	5.3	None	1,663	74.8
Early	515	23.2	Slight	95	4.3
Medium	792	35.6	Medium	117	5.3
Late	714	32.1	Good	348	15.6
Very late	84	3.8			
TOTAL	2,223		TOTAL	2,223	

About 64% of the seedlings were medium-early or earlier. The environmental conditions in 1949 did not seem to be so favorable for seed setting as those of 1948. About 25% of the seedlings set seed in 1949, but in 1948 about 55% produced at least a few seed balls.

Aroostook Farm, Maine

The data for yield and specific gravity for a group of early and medium early varieties are given in P. I. table 8. Seven of the seedlings and Chippewa yielded over 600 bushels per acre, but only B 879-1 and B 904-6 outyielded Irish Cobbler significantly. The specific gravities were on the average lower in 1949 than in 1948. The specific gravity of Irish Cobbler in 1948 was 1.085, but it dropped to 1.074 in 1949. Only four of the seedlings were significantly higher than Irish Cobbler, but 10 of them were as high or higher than the latter variety in specific gravity reading.

P. I. table 8. Yield, percentage of U. S. No. 1 tubers, and specific gravity readings of early and medium-early varieties and seedlings on Aroostook Farm in comparison with Chippewa and Irish Cobbler.

Variety	Yield per acre U. S. No. 1	U.S. No. 1	Specific gravity
	Bu.	Pct.	
Chippewa	628	97.5	1.066
Irish Cobbler	594	96.1	1.074
B 311-64	495	98.6	1.068
B 503-70	497	98.9	1.070
B 616-10	508	97.8	1.070
B 637-14	605	96.3	1.064
B 721-1	612	97.3	1.067
B 721-35	609	98.5	1.066
B 721-51	649	97.9	1.065
B 759-26	433	98.8	1.066
B 879-1	696	99.3	1.067
B 904-6	676	96.3	1.059
B 920-12	521	96.2	1.062
B 921-1	613	99.3	1.062
B 922-5	450	87.2	1.067
B 922-6	528	97.5	1.074
B 945-6	469	87.9	1.087
B 962-1	546	96.9	1.075
B 962-3	606	98.1	1.074
B 962-9	444	90.1	1.080
B 962-32	513	94.5	1.078
B 991-3	519	98.2	1.068
B 991-6	301	96.2	1.068
B 991-13	485	97.1	1.067
B 991-16	482	98.1	1.079
B 993-14	456	97.7	1.073
L.S.D.	99		.004

The yields and specific gravity of 8 late seedling varieties as compared with Katahdin are given in P.I. table 9. This group consists of the best late-maturing selections from the various disease resistance tests. Because of scarcity of seed they were planted in 4 replications of 20 hills each. As a result, the least significant difference between means is very high (120 bu.). Katahdin gave the highest yield -- 721 bushels per acre-- but some of the others were in the same class as Katahdin in respect to yield.

Some of the disease-resistant characters may compensate for a slight yield difference. For example, B 446-8 is resistant to both late blight and ring rot, B 606-67 is resistant to late blight and immune from virus X, and B 962-16 is resistant to blight and scab.

P.I. table 9. Yield and specific gravity data for eight late seedling varieties as compared with Katahdin.

Variety	Yield per acre U. S. No. 1		Specific gravity	Notes
	Bu.	Pct.		
Katahdin	721	98.9	1.065	Resistant to mild mosaic & net necrosis.
B 311-52	716	98.9	1.054	
B 446-8	644	98.6	1.059	Resistant to blight & ring rot.
B 606-67	682	99.3	1.077	Resistant to blight & immune from X.
B 1123-61	638	98.4	1.063	Resistant to ring rot.
B 905-1	559	98.7	1.065	" to blight.
B 913-9.	562	96.5	1.062	" " "
B 961-20	472	97.5	1.071	" " scab.
B 962-16	600	98.1	1.063	" " blight & scab.
L.S.D.	120		.004	

The specific gravity readings were low, but this was true in all the plots in 1949. B 606-67 was significantly higher than any of the others.

In 1948, B 606-67 was the highest in this group in both yield and specific gravity. If the combination of immunity from virus X and resistance to blight is important, this seedling is worth watching. Its tubers were not as well-shaped as those of Katahdin, but they were smoother than Green Mountain. If a combination of resistance to ring rot and late blight is desirable, B 446-8 will meet the requirements, although its specific gravity reading in 1949 was disappointingly low. B 962-16 is one of the best of those showing resistance to both blight and scab.

In P.I. table 10 yield and specific gravity data are given for 25 varieties, which include the blight-resistant sorts introduced by Dr. Donald Reddick of Cornell University, and a number of other recent introductions. The yields of all these varieties were reasonably good, but the specific gravity readings were all low. The specific gravity of Green Mountain was only 1.072, which is exceptionally low for this variety when grown on Aroostook Farm.

Huinkul is a selection that Roberto Milan made from a number of seedlings given to him when he visited this country a number of years ago. He selected it for its long rest period, which seems to be an essential character in Argentina. It produced almost as many U. S. No. 1 tubers in the test as did the Green Mountain.

Progress was significantly lower in yield than 11 of the other varieties. Yampa, a recent scab-resistant introduction, distributed by the U. S. Department of Agriculture and the Colorado Agricultural Experiment Station, yielded about the same as the Green Mountain. B 579-195, which shows some field resistance, yielded almost as much as Green Mountain, and the specific gravity of the two varieties was almost identical. B 514-14 is another of those showing leaf roll resistance.

P.I. table 10. Yield and specific gravity data of 25 varieties grown on Aroostook Farm, Presque Isle, Maine, in 1949.

Variety	Yield per acre U. S. No. 1	Yield per acre U.S. No. 1	Specific gravity mean
	Bu.	Pct.	
Ashworth	527	92	1.063
Chenango	667	93	1.065
Chippewa	642	98	1.061
Empire	480	97	1.062
Essex	632	97	1.055
Fillmore	400	98	1.061
Genesee	671	99	1.066
Green Mountain	678	98	1.072
Houma	616	96	1.066
Huinkul	657	99	1.068
Irish Cobbler	595	97	1.077
Katahdin	608	99	1.065
Mohawk	546	99	1.068
Placid	540	96	1.064
Progress	532	86	1.069
Sebago	550	98	1.061
Sequoia	643	98	1.060
Snowdrift	583	94	1.065
Virgil	549	96	1.062
Yampa	682	98	1.066
B 420-186	483	93	1.067
B 420-208	465	94	1.077
B 420-215	465	98	1.065
B 514-14	568	96	1.073
B 579-195	661	98	1.071
L.S.D.	63		.003

Date of Planting

D. Merriam, R. V. Akeley, and R. Bonde

In 1949 eight varieties were planted at four different dates and data were obtained on yield, percentage of U. S. No. 1's, number of tubers, both primes and culls, and specific gravity of the tubers. The data for these tests are given in P.I. table 11.

The plantings were made on May 3, May 12, May 26, and June 6. The vines were killed by frost on September 10. The best planting date from the standpoint of yield for all eight varieties was May 12. This was followed in order by May 6, May 26, and June 6. The average yield for May 26 was significantly lower than that for May 12, but the greatest difference was found between the plantings made on May 12 and June 6. The eight varieties planted on May 12 yielded on the average 119 bushels per acre, or 27% more of U. S. No. 1 potatoes than of the same varieties planted June 6.

P.I. table 11. Yield, percentage of U.S. No. 1 tubers, number of tubers and specific gravity of tubers of eight varieties of potatoes planted at four different dates on the Aroostook Farm, Presque Isle, Maine, in 1949

Planting date and variety	Yield per acre of U. S. No. 1 tubers		Mean U.S. No. 1 tubers per hill		Specific gravity
	Bu.	Pct.	No.	Pct.	
May 3,1949					
Chippewa	476	95	4.7	82	1.073
Green Mountain	559	95	5.8	85	1.088
Irish Cobbler	423	93	5.5	83	1.084
Katahdin	515	96	4.8	84	1.075
Kennebec	583	95	4.9	82	1.085
Mohawk	528	98	4.0	88	1.087
Sebago	523	96	4.5	84	1.074
Teton	487	95	5.1	85	1.081
Mean	512 1/	95	4.9		1.081
May 12, 1949					
Chippewa	527	93	4.9	76	1.064
Green Mountain	572	96	5.0	85	1.082
Irish Cobbler	419	91	4.7	78	1.083
Katahdin	595	97	5.3	87	1.070
Kennebec	668	97	5.0	84	1.075
Mohawk	529	98	3.6	89	1.081
Sebago	519	96	4.4	81	1.068
Teton	604	97	5.5	89	1.071
Mean	554 1/	96	4.8		1.074
May 26, 1949					
Chippewa	453	95	3.9	82	1.060
Green Mountain	536	95	4.7	81	1.075
Irish Cobbler	430	91	4.6	76	1.075
Katahdin	483	96	4.0	83	1.068
Kennebec	598	98	3.9	89	1.071
Mohawk	441	98	3.2	86	1.073
Sebago	409	96	3.5	82	1.065
Teton	570	98	4.8	89	1.069
Mean	490 1/	96	4.1		1.069
June 6, 1949					
Chippewa	396	92	4.2	75	1.064
Green Mountain	479	93	5.1	79	1.075
Irish Cobbler	332	86	4.2	69	1.076
Katahdin	467	93	4.4	78	1.069
Kennebec	487	96	3.9	85	1.071
Mohawk	472	96	3.8	83	1.077
Sebago	377	92	3.8	76	1.062
Teton	467	94	4.7	81	1.070
Mean	435 1/	93	4.3		1.071
L.S.D. between variety means	83		.61		.004

1/ The L.S.D. between means of the 8 varieties for any 2 dates of planting is 29 bushels.

The Kennebec ranked first in yield in all four plantings; the Irish Cobbler ranked last except in the plots planted May 26 in which the Sebago ranked last. The potatoes planted on June 6 had only 96 days to grow, and yet Kennebec yielded at the rate of 487 bushels per acre. In contrast, the Irish Cobbler, a short-season variety, yielded 332 bushels per acre. It is evident that Kennebec produces a high yield of potatoes in a short growing season, but the yield of 668 bushels per acre for the May 12 planting shows what it will do when it grows for a longer period. Planted May 12, Kennebec produced 181 bushels per acre more than it did when planted June 6.

In general, the same holds true for all the varieties tested. However, early planting should be emphasized for the Sebago. Planted May 3 or May 12 this variety yielded 100 bushels per acre more than the Irish Cobbler but planted May 26 or June 6 it yielded much less than it did in the two early plantings.

The number of U. S. No. 1 tubers per hill was about the same for all dates of planting, but the tubers of the earlier plantings were larger, as indicated by yield data.

The tubers from the plots planted May 3 gave the highest specific gravity reading and consequently the best cooking quality. Green Mountain, Irish Cobbler, Mohawk, Kennebec, and Teton had a specific gravity higher than 1.080, which is considered by some to be high enough for excellent baking quality. Chippewa, Katahdin, and Sebago had specific gravities of 1.073 or better, which is high enough for good baking quality and excellent for boiling. The specific gravity readings for later plantings are considerably lower than those for May 3, and the cooking quality is correspondingly lower.

From the data in P.I. table 11 it can be concluded that for best results in yield and quality early planting is recommended.

Scab Resistance

The scab test in 1949 contained 1,069 seedlings, representing 43 families, which were planted in 2-hill rows adjacent to Green Mountain check rows. Twenty-two parents were also included in the test. Of the 1,069 seedlings tested 54 showed only a trace of surface covered with scab at harvesttime, and 370 had a mean coverage of 10 percent. These two classes equal 424 seedlings or 39.7 percent of the total. The 1,069 adjacent Green Mountain checks showed 30 percent or more surface coverage, and all had type 3 pustules. If pustule types 1 and 2 are considered as the resistant ones, then 532 seedlings, or 49.8 percent are more resistant than the checks. Hindenburg, X 157-9, and B 381-2 were apparently very resistant to scab. Several other parents were nearly as resistant.

P.I. table 12 gives a summary of the data obtained for the scab tests in 1949.

P.I. table 12. Summary of the data obtained on the scab tests on the Aroostook Farm, Maine, in 1949.

Material tested	No.	Surface area covered 1/					Type of pustule 2/				
		T	1	2	3	4	1	2	3	4	X
Seedling varieties.....	1,069	54	370	470	174	1	110	432	519	6	2
Green Mountain checks.....	1,069			20	827	222			1,069		

1/ Surface area covered

T = less than 1%
1 = 1 to 20%
2 = 21 to 40%
3 = 41 to 60%
4 = 61 to 80%

2/ Type of pustule

1 = small superficial
2 = Larger but still superficial
3 = Large, rough pustules
4 = Large pustules with holes
X = Russet type

Late Blight Resistance Tests

In 1949, 39 family lines, totaling 797 seedlings, planted in 2-hill rows, were exposed to late blight on the Kempton Farm, Maine. The vines were sprayed with spores soon after germination in the field. Two applications of DDT only were used for insect control. On August 16, 5 tubers of each seedling in the blight test were harvested from duplicate plots grown on the Chapman Farm, and within 72 hours inoculated or sprayed with spores of common blight. The inoculated tubers were put into a dark moist bin in the potato house at optimum temperature for about 10 days to induce late blight rot.

Approximately 52.1 percent or 415 seedlings were more resistant than Sebago or President in their foliage. Only 3 seedlings showed no lesions at all. None of the parents was entirely free of late blight lesions.

In the tuber test, 791 seedlings were inoculated. Of these 470 or 59.4 percent remained free from blight rot and 152 or 19.2 percent showed only a trace. At least half of the parents tested were also free or showed only a trace of blight rot.

The summary for the data obtained in this test is given in P.I. table 13.

When seed of the W races of potatoes was received in 1934 from Dr. K. O. Müller of Berlin-Dahlem, Germany, it was known that these races carried genes for immunity to the A or common physiological forms of late blight but not to the S forms. It was no surprise therefore when blight forms were found in this country that would attack Kennebec and its relatives. Immunity to some of the more virulent blight races has been found in a number of Dr. Reddick's seedlings that are related to Solanum demissum. One of these, TI 5, has been used in a parent, and we have produced a number of seedlings that so far have not become infected with any of the races in the Beltsville collection. At least one of these has commercial promise. It is now being tested for yield and quality.

P.I. table 13. Summary of the data obtained on the tests for resistance to late blight in the field at Presque Isle, Maine, in 1949.

Varieties	No. in test	Foliage classes 1/								Tuber classes 2/						
		0	1	2	3	4	5	6	7	Seedlings tested	0	1	2	3	4	5
		No.								No.						
Seedling varieties	799	3	147	127	138	100	185	58	41	791	470	152	91	36	32	10
President checks...	15					3	12									
Green Mt. checks...	15						15									

1/ Foliage classes

0 = Free from late blight.
1 = Occasional leaf with late blight spots.
2 = 8 to 12 compound leaves per hill with late blight spots on a few of the leaflets.
3 = Approximately half of leaflets with late blight spots.
4 = Approximately 2/3 of leaves dead.
5 = All but apical leaves killed.
6 = Stalks green, all leaves killed.
7 = All leaves and stalks killed by late blight.

2/ Tuber classes

0 = No rot on any of the tubers.
1 = 1 out of 5 tubers with late blight rot.
2 = 2 out of 5 tubers with late blight rot.
3 = 3 out of 5 tubers with late blight rot.
4 = 4 out of 5 tubers with late blight rot.
5 = 5 out of 5 tubers with late blight rot.

Effects of Sprays on Yield of Certain Potato Varieties

P. M. Lombard and R. V. Akeley

In spite of the fact that Kennebec is immune to the common physiologic races of late blight prevalent in Maine, many growers spray this variety with Bordeaux mixture as often as they spray Green Mountain.

In 1949 a test was made to study the effects of various sprays on Kennebec, Menominee, Green Mountain, and Katahdin. Four treatments were used: Bordeaux, Bordeaux + DDT, DDT, and no spray. The design

of the experiment was a 4 x 4 Latin square. The 4 varieties were planted in each block with 4 border rows on each side to protect the varieties under test from spray drift. Each plot consisted of 25 hills planted 12 inches apart, and the rows were 34 inches apart. The plots were inoculated with late blight on July 14, and a heavy epidemic of the disease was soon prevalent on the susceptible varieties. The first sprays were applied on June 29 and repeated at weekly intervals throughout the remainder of the growing season.

The yield data for this test are given in P. I. table 14.

P.I. table 14. The effect of sprays on the yields of 4 varieties of potatoes grown on Aroostook Farm, Presque Isle, Maine, in 1949.

Sprays	Yield U. S. No. 1 per acre							
	Kennebec		Menominee		Green Mt.		Katahdin	
	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.	Bu.	Pct.
Bordeaux	464	96	379	94	389	95	360	96
Bordeaux + DDT	507	96	416	96	472	96	449	97
DDT	599	96	355	95	315	93	357	95
Check (no spray)	475	96	347	93	274	92	292	93

L.S.D. for treatment = 37.3 bushels
L.S.D. " varieties = 33.0 "
L.S.D. " two varieties at the same treatment 66.0 bushels
L.S.D. " treatment means in same or different varieties..... 67.8 "

The yields for the Kennebec variety indicated that the Bordeaux in itself had little or no effect. The mean yield for the plots sprayed with Bordeaux was 11 bushels less than for the check plots that were not sprayed. However, there was a highly significant difference --124 bushels per acre-- between the plots sprayed with DDT and the checks. The plots of Kennebec sprayed with DDT alone yielded 599 bushels, but when sprayed with Bordeaux + DDT the yield was 507 bushels per acre. This is a highly significant difference and might indicate that the Bordeaux had a depressing effect on the yields of this variety. The high yields produced by the plots sprayed with DDT could not indicate a fungicidal effect, as has been supposed by some, since none of the Kennebec plots was infected with blight. Furthermore, the difference could not be accounted for by assuming that the DDT kept the plants growing longer, since they were all planted on the same date, and they were growing vigorously when they were killed by frost on September 10.

The Menominee has an intermediate type of resistance to blight. In the case of this variety there was no significant difference between the yields of the check plots, the plots sprayed with Bordeaux, or the plots sprayed with DDT. There was a significant difference between the yields of the check plots and that of the plots sprayed with Bordeaux + DDT. The blight-susceptible varieties Green Mountain and Katahdin

gave the highest yields when sprayed with Bordeaux + DDT. Bordeaux alone on Green Mountain gave a significantly higher yield than did DDT alone. On the other hand, there was no significant difference between the yields of the Katahdin plots with these two spray treatments.

The results here might indicate that DDT has a fungicidal effect but this spray gave the highest yields with Kennebec, which requires no fungicide. It is more likely that two factors were involved: blight and insect populations. In the case of the Green Mountain blight probably cuts the yield more than insects, as indicated by the comparison between the effects of Bordeaux and DDT. On the other hand, Katahdin is injured about as much by insects as by blight so that no difference was shown between the plots of Katahdin sprayed with DDT and those sprayed with Bordeaux.

These results are for one year only, and the test should be repeated, but a number of interesting relationships are indicated in these data.

Reactions of potato seedling varieties to virus Y in field-exposure to virus-Y 42898 seedling variety. Aroostook Farm, Presque Isle, Maine, 1949

E. S. Schultz

Five hundred thirty potato seedling varieties, representing 6 crosses and Chippewa selfed were planted so that 5 hills of a variety alternated with virus-Y 42898 seedling hills on Aroostook Farm, Presque Isle, Maine. Exposure of these varieties began in 1949. Chippewa, which is highly field-resistant to virus Y, represented the female parent in the 6 crosses. The virus-Y-susceptible Green Mountain served as a control. The data for these tests are given in P. I. table 15.

On July 17 when most of the varieties were in blossom viruliferous Myzus persicae infested 42898 leaflets were deposited onto every hill of the potato seedling varieties and the Green Mountain controls to supplement natural field infestation. Environmental conditions favored heavy aphid population within a month after the plants were artificially infested.

On August 26 observations disclosed that 84 to 100 percent of the potato seedling varieties and every hill of the 125 Green Mountain controls had contracted virus Y. Most of the varieties manifested virus Y by severe leaf and stem necrosis, whereas a few varieties showed slight necrosis. Five Chippewa control hills contracted virus Y in every hill.

Fifty-one potato seedling varieties that had not contracted virus Y in the 1943 to 1948 field-exposure tests were infested with virus Y viruliferous Myzus persicae in 1949 by the same method as recorded previously. These varieties represented 5 crosses and Chippewa selfed. On August 27 observations disclosed that 96 to 100 percent of these varieties had contracted virus Y in the form of leaf and stem necrosis.

Experience with reaction of potato varieties to virus Y had shown that Chippewa, Katahdin, and some of their progeny contract virus Y less easily than Green Mountain and similarly susceptible varieties under average field conditions. However, when such field-resistant varieties are subjected to heavy aphid infestation they contract virus Y very generally, which indicates that this field resistance to virus Y apparently is in part, at least, associated with vector dosage.

Though field-resistant varieties, like Chippewa, rarely contract virus Y under average field conditions, it is apparent that more highly resistant, or possibly immune from virus Y, varieties are essential to insure against virus Y epiphytotics when heavy aphid populations carrying virus Y occur.

P.I. table 15. Reaction of potato seedling varieties to virus Y in field-exposure to virus-Y 42898 seedling potato variety 1/. Aroostook Farm, Presque Isle, Maine, 1949.

Parentage	Pedigree number	Varieties	Year exposed	Virus Y varieties	Virus Y hills in infected varieties
		No.		Pct.	Pct.
Chippewa x B 76-23	B 2065	33	1949	94	100
" x (X 247-48)	B 2066	39	1949	100	100
" x B 381-2	B 2067	157	1949	98	100
" x B 522-33	B 2068	30	1949	97	100
" x (X 528-170)	B 2069	100	1949	96	100
" x B 594-46	B 2070	127	1949	99	100
Chippewa selfed	B 1172	44	1949	84	100
Controls 2/					
Chippewa		1	1949		100
X 528-170		1	1949		100
X 247-48		1	1949		100
B 522-33		1	1949		60
B 76-23		1	1949		100
B 381-2		1	1949		100
Green Mountain		25	1949		100
Chippewa x (X 792-94)	B 982	23	1948-1949	100	100
X 792-94		1	"		100
Chippewa		1	"	100	100
Chippewa selfed	B 1043	93	1943-1949	100	100
Katahdin x 792-94	B 205	99	"	99	
1241-66 x 792-94	B 208	12	"	100	
1241-62 x 792-94	B 209	14	"	100	
792-133 x 1241-84	B 210	7	"	100	
1241-62 x 792-76	B 524	135	1945-1949	96	
1276-173	B 1115	16	"	100	
1276-185	B 1116	4	"	100	
Green Mt. control		3 2/	1949	100	

1/ Virus Y leaflets of virus Y seedling potato variety 42898 infested with Myzus persicae under cloth cages were deposited (50 to 100 aphids to a hill) onto the seedling potato varieties in the field, July 17, 1949, when the plants were in blossom.

Virus X Resistance

E. S. Schultz

Seedling potato varieties were exposed to common race of virus X in Mohawk variety in alternate hills on Aroostook Farm, Presque Isle, Maine, 1948. Inarch grafted to weak race of virus X Green Mountain, Beltsville, Md., greenhouse, January 1949. Tested on Datura stramonium, Aroostook Farm greenhouse, July 1949.

Potato seedling varieties representing 25 different crosses and covering 441 varieties were planted in the greenhouse where at least 5 shoots of each variety were inarch grafted to Green Mountain shoots harboring weak virus X to determine virus X immunity in grafts. Each cross had one virus-X-immune parent. In all but 2 crosses the virus-X-immune parents also harbor immunity from virus A. Resistance to virus Y, late blight, common scab, and ring rot also is harbored by certain parents in these crosses. Results of these tests are given in P.I. table 16.

In 1948 these seedling potato varieties were planted in alternate hills (5 hills of a variety) with common virus X Mohawk. In 1949 the varieties that did not give the X-immune reaction in grafts were again planted in the field when they were tested on Datura stramonium for field resistance to virus X.

The results show that X-immune varieties resulted from every cross, that more than half of the varieties in 13 crosses are X-immune, and that field-resistant but not X-immune varieties result from 23 crosses. Most of the 40 Green Mountain seedling variety controls (5 hills to a control) contracted virus X in every hill.

The results with virus-X resistance show that virus-X immunity can be combined with resistance to some of the other potato diseases.

P.I. table 16. Virus X resistance. Seedling potato varieties exposed to common race of virus X in Mohawk in alternate hills in the field, Aroostook Farm, Presque Isle, Maine, 1948. Inacrch grafted to weak race of virus X Green Mountain, Beltsville, Md., greenhouse, January 1949. Tested on Datura stramonium, Aroostook Farm, July 1949.

Pedigree No.	Parentage	Varieties tested	Reaction of varieties to virus X			
			Immune	Top necrosis	Virus X contracted in field	Field resistant 1/
		No.	Pct.	Pct.	Pct.	Pct.
B 884	X 792-88 x (X 157-9)	22	50		32	18
B 885	X 792-94	10	10		70	20
B 886	41956 x "	6	33		50	17
B 917	792-88 x B 231-3	9	66		11	23
B 919	B 355-24 x (X 792-54)	24	54		33	13
B 926	B 66-1 x (X 792-54)	11	54	36	18	28
B 927	O 55 x "	13	76	23		24
B 928	X 792-88 x Teton	10	30	10	60	10
B 929	(X 792-88) x B 81-40	41	32	19	20	49
B 930	Teton x (X 792-94)	30	56	3	30	14
B 931	B 355-24 x "	17	65		35	
B 932	41956 x B 81-40	12	33	33	25	42
B 936	X 792-94 x B 294-36	27	37		55	8
B 939	41956 x "	31	51		35	14
B 944	B 294-22 x (X 792-94)	23	56	8	30	14
B 945	Ostbote x "	24	50	25	8	42
B 951	Starkeragis x "	6	16	66		84
B 952	41956 x Starkeragis	5	40	20	40	20
B 953	Mohawk x (X 792-94)	14	72		7	21
B 982	Chippewa x "	19	42	26	10	48
B 983	X 792-88 x "	9	77		22	1
B 984	Green Mt. x (X 792-94)	10	50		50	
B 985	Mohawk x (X 792-94)	11	72		18	10
B 988	B 231-3 x "	34	67		15	18
B 989	B 192-17 x "	19	42		58	
B 1162	X 792-94 selfed	12	75		17	8
	Mohawk	5 2/			100	
	Chippewa	5			100	
	Green Mountain	5			100	
	Teton	5		100	100	
	41956	5	100			
	X 792-88	5	100			
	X 792-94	5	100			
	Starkeragis	5		100		
	B 294-22	5				100
	B 294-38	5			100	
	B 71-4	5			100	
	B 192-17	5			100	
	B 355-24	5			100	
	B 351-44	5			100	
	B 355-44	5				100
	Green Mountain seedling	200 3/			95	

2/ 5 hills.
3/ 200 hills.

1/ Not X-immune varieties but varieties that did not contract virus X in the field in 1948, as determined by tests on Datura stramonium.

SOUTHERN STATES PROJECT
(Louisiana Headquarters)

Theodore P. Dykstra, United States Department of Agriculture and Raymon E. Webb, Julian C. Miller, Louisiana State Experiment Station.

Most of the investigations of potato breeding for the Southern States is conducted cooperatively between the Louisiana State Experiment Station and the United States Department of Agriculture. Although the latter agency is primarily interested in phases of regional importance and the State Experiment Station in the problems affecting the potato industry in the State, it is difficult to draw a sharp line of demarcation, since there is considerable overlapping of interest.

The potato-breeding work consisted of producing seed of crosses in Baton Rouge, La., at Crossville, Tenn.; growing and transplanting first-year seedlings in the greenhouse at Baton Rouge; increasing seedlings at Crossville, Tenn.; distributing seedlings and varieties to cooperating States; testing seedlings for resistance to late blight, early blight, and to scab; and conducting yield tests of the most promising seedlings and varieties.

In addition to the production of our own seed, the potato program for the Southern States has been greatly strengthened by receiving from Dr. F. J. Stevenson, USDA, Beltsville, Md. true seed from crosses providing for the combination of disease resistance and other characters desirable for the production of potatoes in the South. In the summer of 1949 a large number of desirable selections from first-year seedlings grown in the field, as well as a large number of seedlings which had been grown for a number of years and had been tested for disease resistance, were selected from the pl at Presque Isle, Maine. The parentage and all the characteristics of these were obtained, and these seedlings will therefore provide exceedlingly valuable material for future breeding studies.

Testing seedlings for resistance to diseases is now confined almost entirel to the greenhouse and coldframes in Baton Rouge, La. Climatic conditions in the South are too variable to provide uniform favorable conditions for the development of disease in the field. This applies especially to late blight and early blight, and to a lesser extent to scab. On the other hand, the winters are mild here, and in addition to work in the greenhouse, coldframes can be used advantageously. By keeping the latter covered with sash, it is possible to control the moisture content of the soil, which is primary importance in the development of scab. During some years it has been difficult to obtain scab in the regular scab plot, whereas in other years uniform infection was generally obtained. It has been difficult to explain this discrepancy and to determine whether this was due to climatic conditions or to anti-biotic activities in the soil.

A coldframe was prepared by mixing into the soil two truck loads of scab-infested soil obtained from our regular scab plot. In addition to this, 1,000 pounds of soil was obtained from Prosser, Wash. from a field where the soil is so badly infested with scab that ordinarily the entire surface of tubers grown in that soil is covered with scab lesions.

Seed obtained from crosses of scab-resistant parents was sowed in flats, and the seedlings were transplanted in sterile soil 3 inches apart in flats in the greenhouse. After the plants were about 5 inches tall they were transplanted into the scab-infested soil in the coldframe 6 inches apart in both directions. About a week later, and once 2 weeks after that, spore suspensions from 20 different strains of Actinomyces scabies obtained from Dr. L. A. Schaal, Fort Collins, Colo., were poured around these seedlings. Since seedlings obtained from some of these crosses carried blight resistance in addition to scab resistance, the seedlings were inoculated with a suspension of zoospores of Phytophthora infestans as soon as the tubers were large enough to check for scab infection. This enabled us to take readings on scab resistance, as well as on late blight resistance. Only the scab- and late-blight-susceptible seedlings were discarded; the others were saved and will be transplanted for increase at Crossville, Tenn.

The progenies from crosses carrying factors for late blight resistance were tested by placing seedlings growing in 3-inch pots in two greenhouse benches on top of which a wooden frame 3 feet tall was constructed, and this was covered with muslin. Two 1/2-inch pipes, 28 inches from the surface of the bed, 2 feet apart, extending the length of the bed, were connected with the city water system. Spray nozzles similar to the ones used in grocery stores to keep vegetables fresh were attached to each of the two pipes at alternate positions at 4-foot intervals. This provides for a coverage of the foliage of the plants with a fine film of moisture and high humidity ideal for infection. The fungus Phytophthora infestans is cultured on media consisting of navy beans and peanut hulls. The fungus grows and sporulates freely on this media. The spores are washed from this media, and a water suspension of the spores is placed at a temperature of 12° to 14° C., where it is kept for about 4 hours. At that time each conidiospore has developed into four zoospores. After the foliage of the seedlings in the moist chamber are covered completely with a film of moisture, the plants are inoculated after sundown by spraying these with a suspension of zoospores with an atomizer. About a week later the seedlings are inoculated by the same method once more so as to avoid as far as possible escapes of seedlings not inoculated. Two weeks after inoculations, readings are taken, and any seedling that shows even the slightest degree of infection is discarded. The healthy seedlings are permitted to mature in the greenhouse, and at that time one tuber of each pot is saved and placed in the bag along with those of all the other plants of the same progeny. These progenies, along with others, are planted in the increase plot at Crossville, Tenn.

Last year was the first time that this procedure was used. About 6 percent of the late-blight-resistant seedlings met the requirements of tuber shape and size at digging time. Enough tubers were saved from each of these hills to plant about 10 hills next year, as well as enough to plant 5 pots in the greenhouse in the winter for additional testing. These potted plants were placed in the moist chamber this fall and subjected to a severe infection of Phytophthora infestans. Some of these plants became infected. It is not known whether this happened because seedlings escaped infection last year or because the plants grown from tubers and at a more advanced stage of maturity are more susceptible, or whether a somewhat

more virulent strain of Phytophthora was used. At this stage of the development of the project no attempt has been made to test individual strains of the causative fungus. Plans for a detailed study of these investigations have been made as this phase of the work progresses.

Last-year seedlings were subjected to infection of late blight when they were 6 to 8 inches tall. This year they were inoculated after small tubers had already been formed. At the time the seedlings were sprayed with zoospores of Phytophthora infestans, they were also inoculated with Alternaria solani. This was done because contrary to the name early blight this disease does not occur until the plants have reached a fairly advanced stage of maturity. This procedure will not give any information on the relative susceptibility of the progeny of a certain cross to early blight since all seedlings susceptible to late blight have previously been killed. From a practical point of view this is not important since only seedlings resistant to late blight should be considered in testing for early blight resistance. It would not be of any particular advantage except for breeding purposes to have a seedling resistant to early blight, but susceptible to late blight. Our aim is to confine our selection of early-blight-resistant seedlings to those seedlings and varieties already proved to be resistant to late blight. So far, it has been difficult to produce a severe epidemic of early blight on potato foliage in the greenhouse moist chamber. Some infection is obtained but is not sufficiently uniform to permit readings on the relative degrees of susceptibility of seedlings. More studies will have to be conducted to determine the ideal conditions for infection of early blight. A yield test at Thibodaux, La., showed the relative yields of a number of named and numbered varieties, as well as a number of comparisons of Maine-grown seed versus seed grown in Tennessee. The data for these tests are given in table 1. It will be noted that Kennebec

Table 1. Yield of Irish potatoes from Maine and Tennessee seed, grown at Thibodaux, La. Planting Date: February 11, 1949
Harvesting Date: May 10, 1949

Variety or Number	Source of Seed	Yield of No. 1 potatoes
		Bu.
Kennebec	Maine	239
Kennebec	Tenn.	230
B 76-43	Maine	245
B 76-43	Tenn.	183
B 73-10	Maine	200
B 73-10	Tenn.	205
Marygold	Maine	209
Sebago	Maine	193
Sebago	Tenn.	115
B 61-3	Maine	187
B 61-3	Tenn.	158
Sequoia	Maine	165
Sequoia	Tenn.	171

Dykstra, et al, table 1, cont'd

Variety or Number	Source of Seed	Yield of No. 1 potatoes
		Bu.
Menominee	Maine	165
Menominee	Tenn.	164
B 69-16	Maine	169
B 69-16	Tenn.	176
Pontiac	Maine	158
Pontiac	Tenn.	151
Bliss	Maine	135
Bliss	Tenn.	65
B 73-3	Tenn.	129
Red Warba	Maine	118
Red Warba	Tenn.	126
B 73-16	Tenn.	113
Chippewa	Maine	106
Chippewa	Tenn.	74
Teton	Maine	110
Teton	Tenn.	97
Cayuga	Maine	102
Cayuga	Tenn.	64
Kasota	Maine	110
Kasota	Tenn.	43
Pawnee	Maine	92
Pawnee	Tenn.	95
B 75-4	Maine	92
B 70-4	Maine	88
Mohawk	Maine	86
Mohawk	Tenn.	86

L.S.D. = 48.5 bushels
Difference at 5% level

ranked second in yield with no significant difference between the yields of the plots planted with Maine seed and those of the plots planted with seed grown in Tennessee. B 76-43, on the other hand, ranked first as far as Maine-grown seed was concerned, but the yields of the plots grown from Tennessee seed were significantly lower than those grown from the Maine seed.

A yield plot and tests for adaptability were maintained this year at Russeltown in the Rio Grande Valley in Texas, (table 2). The plots were

Table 2. Yield of Irish potatoes planted at Russeltown, Tex.
Planting date: January 24, 1949
Harvesting date: April 28, 1949

Variety or Number	Source of Seed	Yield of No. 1 potatoes
		Bu.
B 76-43	Maine	155
B 76-43	Tenn.	110
Sebago	Maine	130
Sebago	Tenn.	90
Kennebec	Maine	101
Kennebec	Tenn.	94
Red Warba	Minn.	107
Red Warba	Tenn.	67
LaSoda	Tenn.	104
8557	Colo.	101
B 69-16	Tenn.	100
8859	Colo.	99
Pontiac	Tenn.	94
9329	Colo.	92
B 73-10	Maine	90
B 73-10	Tenn.	64
B 61-3	Maine	90
B 61-3	Tenn.	61
8439	Colo.	87
3175	Colo.	86
Teton	Maine	84
Katahdin	Maine	75
Cayuga	Maine	75
B 70-4	Maine	69
1589	Tenn.	69
B 73-3	Tenn.	67
1485	Colo.	67
1111	Colo.	67
6574	Colo.	67
1599	Tenn.	66
Mohawk	Maine	65
B 73-16	Tenn.	65
Menominee	Maine	64
Bliss	Maine	65
Bliss	Tenn.	59
6668	Colo.	56
7790	Colo.	55
Chisago	Minn.	55
Norkota	Maine	55
Kasota	Minn.	54
3038	Colo.	52
Pawnee	Colo.	50
1588	Tenn.	49
Satapa	Minn.	48
5218	Colo.	46
B 75-4	Maine	46

Variety or Number	Source of Seed	Yield of No. 1 potatoes Bu.
B 96-44	Maine	45
42	Minn.	37
1580	Tenn.	29
7432	Colo.	26
		L.S.D. = 22.7 bushels Difference at 5% level

maintained at a private farm, and arrangements had been made with the grower to irrigate the potatoes at regular intervals, but on account of unforeseen difficulties it was not practical to irrigate the potato plot. Because of an excessively dry soil a very low yield was produced. Although these yields do not present a true picture of the yields that would have been produced under normal conditions, these results may have some value in showing that under extremely dry and unfavorable growing conditions certain varieties still produced a fair yield.

Some interest has developed recently in the possibility of growing potatoes exclusively for canning. The requirements of a variety suitable for this purpose are a heavy set of small, smooth potatoes with shallow eyes, and quality suitable for canning. Several seedlings were grown in the plot in the Rio Grande Valley for this purpose. One seedling, a cross of Hindenburg X 44-14, appeared to be especially promising. A very heavy set of uniform, small, smooth potatoes developed and these were scab-resistant.

Although the primary objective in the development of the potato improvement program of the Southern States is to develop varieties suitable for the early potato growing sections, there are areas in the higher elevated sections of Tennessee, Georgia, and North Carolina that require a medium late-maturing variety. Seedling varieties B 76-43, B 69-16, Kennebec, and a number of other more recently developed seedlings when tested in these areas have given significantly higher yields that those of some of the old established varieties.

G. D. Ruehle reported from Homestead, Fla. that one of the serious problems in potato growing in that area is an unsightly scurfiness which appears to be caused by a mild strain of Actinomyces scabies, the causal organism of scab. Some of the seedlings sent to Homestead remained free of this scurfiness, indicating resistance. Efforts will be made to develop a suitable variety resistant to this condition.

W. S. Anderson reported from Mississippi that stem blight continues to be a serious problem. Several seedlings are tested annually for resistance to this disease under field conditions, and during the winter in a greenhouse test by planting tubers in soil in benches inoculated with the causative fungus.

Although slight variation in resistance is noted among the different seedlings, it is not of sufficient importance to provide selected material for breeding. Until a seedling is found that shows marked resistance it will be necessary to continue to test seedlings at random in the hope of finding a resistant one. Unusually hot and rainy weather during 1949 caused early dying of the plants resulting in disappointing low yields.

Wm. Epps tested our seedlings at the South Carolina Truck Experiment Station. The potato plants were cut back by frost twice during the growing season, making it difficult to determine accurately the date of maturity of the various lines. Late blight resistance and a suitable variety earlier than Irish Cobbler are desired. Although unfavorable weather conditions made it difficult to evaluate the different seedlings, several seedlings looked very good.

A. H. Eddins at Hastings, Fla. stated that several outstanding seedlings were found among the ones submitted for testing but that none of these were resistant to late blight. He was anxious, however, to continue to grow these for additional tests.

F. E. Garret tested our seedlings at Fairhope, Ala. The development of a late blight epidemic provided an excellent opportunity to test these for resistance. Several of the seedlings showed a very high degree of resistance, including some red seedling varieties. So far, most of the blight-resistant seedlings are found among the white varieties. As a result of our present breeding program, we expect to have within the next few years a large number of desirable red, blight-resistant seedlings.

One phase of the investigations emphasized by Louisiana is to test duplicate seedlings from the increase plot in Tennessee, in Louisiana, and in South Dakota, to determine their behavior in the seed-producing areas. The seedlings for South Dakota were planted in May and harvested in September. Hot, dry weather prevailed during the growing season. The weather conditions provided an excellent opportunity to eliminate seedlings that expressed a tendency to develop heat sprouts. Observations made on duplicate plantings in Louisiana and Tennessee aided greatly in the selection of the second-year seedlings in South Dakota.

Several seedlings appearing promising in the Louisiana and Tennessee plantings produced long stolons with small potatoes or no potatoes in South Dakota. A large number of seedlings were promising at all locations.

The second-year seedlings considered worthy of further trials were divided into two lots. One lot is to be increased in South Dakota for adaptability and yield trials. The other lot was sent to Louisiana for yield trials and total solids determinations.

It is desirable to know whether varieties grown as a spring crop in Louisiana provide desirable seed potatoes for planting a fall crop. Of the 5-hill plots planted in the spring, sufficient seed was saved to plant 12-hill lots in the fall. These were checked for their adaptability for fall production. Several of these appeared to be promising and will be included again in the spring-planted seed test.

The results of the yield test are given in table 3. DeSoto gave the

Table 3. Average yield Bu/A of the potato variety tests at five locations in Louisiana.

Variety	Yield per acre and location in Louisiana				
	Baton Rouge	Thibodaux	Plaquemine	Hammond	Calhoun
	Bu.	Bu.	Bu.	Bu.	Bu.
DeSoto	146.6	147.4	136.1	181.5	67.0
Katahdin	146.6	174.2	113.4	143.7	44.0
LaSoda	113.9	112.5	181.5	135.6	55.0
Triumph	83.0	98.0	163.4	192.0	51.1
LaSalle	112.4	90.8	90.8	135.6	48.5
LD 5%	27	32	33	20	--
1%	36	43	48	28	--

highest yield except in two locations. This variety seems to prefer sandy soils. The tubers are oblong, very smooth and retain the red color well, even during a wet season. The LaSoda variety is better adapted to the medium and heavy soil types. Although the tubers are smoother in the higher soils, they have a tendency to fade in color during wet weather.

Since the seed potatoes of the LaSoda variety included in the Thibodaux and Baton Rouge test came from Tennessee, had had a long dormant period, and were killed early by late blight, the low yield of this variety is somewhat misleading.

The source of seed test consisted of five varieties obtained from three different sources: Northern Seed, Louisiana spring seed, and Louisiana fall seed. Several strains were included from the fall seed source to be checked with the yields of Katahdin. This variety normally produces a good fall crop, and the yields from fall-grown seed of this variety are comparable to yields from northern seed.

Varietal differences are expressed in their ability to produce high yields regardless of the source of seed. Kennebec gave the best yield of all varieties from the northern source of seed. This variety ranked last from the fall seed. DeSoto, Katahdin, and LaSalle produced yields from the fall source of seed that were comparable to yields from the northern seed. Several seedlings shown in table 4 are promising as a fall source of seed.

Table 4. Source of seed and length of seed storage test.

Variety	Seed Source	Storage Period	Mean Yield per acre
			Bu.
Kennebec	Northern	4 1/2 mos.	180.6
DeSoto	Northern	4 1/2 mos.	146.6
Katahdin	Northern	4 1/2 mos.	146.0
LaSoda	Northern	4 1/2 mos.	135.9
LaSalle	Northern	4 1/2 mos.	112.4
Katahdin	Spring	8 months	83.0
LaSoda	Spring	8 months	71.8
DeSoto	Spring	8 months	63.5
LaSalle	Spring	8 months	63.5
L70	Fall	2 1/2 mos.	138.4
LaSalle	Fall	2 1/2 mos.	132.9
Katahdin	Fall	2 1/2 mos.	130.7
DeSoto	Fall	2 1/2 mos.	130.7
L118	Fall	2 1/2 mos.	126.1
L57	Fall	2 1/2 mos.	120.1
L66	Fall	2 1/2 mos.	120.1
LaSoda	Fall	2 1/2 mos.	63.5
Kennebec	Fall	2 1/2 mos.	62.6

L.S.D. 5% = 26.7 bu.
1% = 35.5 bu.

U. S. D. A. Potato Field Station (Greeley, Colo.)

W. C. Edmundson

The potato-breeding work for the year 1949 consisted mostly of breeding for scab resistance with both red and white varieties, the parent material being supplied from Beltsville. A number of these seedlings carried a factor for blight resistance.

At the station the testing of seedlings included the first-year seedlings in family lines, second-year seedlings in 5-hill lots, increase plot in 32-hill lots, the testing of older seedlings on a field basis, and a yield test of seedlings and new varieties.

In addition to test plots at the station, some of the more promising seedlings were tested on two farms in the early potato section at Gilcrest, Colo. Tests were also conducted on a farm at Eaton and at Ault in the late potato section. Seedlings were sent to the State station at Rocky Ford, Colo. Seedlings developed at the station were also tested in Indiana, Idaho, Mississippi, Oregon, and Washington. Extensive tests for scab resistance were made by Dr. L. A. Schaal at different locations throughout the State.

The rainfall for the 1949 growing season was above normal for May and June and very low for August and September. In May there was 3.55 inches of rain and in June 3.70 inches was recorded. There was but 0.04 inch of rain in August and only 0.50 inch for September. Owing to the wet soil and frequent rains in June, the planting of all test plots at the station was delayed. The first planting was made on June 16. The quality of the crop would probably have been better if the planting could have been made earlier.

No late blight was noted in any of the plots, and very little early blight made its appearance. The psyllid population was much larger than in recent years, according to counts made of the psyllids in the check plot of the spraying experiment. Very little psyllid yellows was found in any of the spray plots except in the unsprayed plots. All seedling plots were sprayed four times with DDT and Parzate or DDT and Dithane.

All family lines of the 1949 seedlings were planted at the station this year. Greeley table 1 gives the data for tuber color of these seedlings. In 1948 they were planted at Yampa, Colo. in the mountain section. The lots selected from these family lines will be planted in 5-hill lots at the station in 1950. A large number of these selections will also be planted in the scab test plots at Gilcrest by Dr. Schaal.

A large number of the 5-hill lots were retained at time of harvest. These lots have since been carefully examined, and those that were infected with scab, or indicated a tendency to growth crack, were discarded. Some family lines showed a greater tendency to growth crack than others. All the lots that were retained for further tests will be planted next year, on a tuber unit basis in 32-hill lots.

Greeley table 1. Data on tuber color of the new seedlings grown in 1949.

	Parentage	Russ.	Reds	Light Red	White pink eyes	White	Total
		No.	No.	No.	No.	No.	No.
1-50	B 400-1 x 874-56R		2	42	42	92	178
2-50	874-88R x 874-56R		12	24	24	106	166
3-50	874-35 x 874-56R		16	23	6	49	94
4-50	874-2R x 874-56R		0	14	21	83	118
5-50	874-108 x 874-56R		15	45	15	232	307
6-50	CS9741R x B 400-1R		3	7	137	49	196
7-50	CS7724R x 874-56R		0	12	49	62	123
8-50	CS9310R x CS9741R		3	22	86	68	179
9-50	B874-35R x CS7724R		0	8	59	88	155
10-50	B400-1R x CS7724R		8	11	93	38	150
11-50	B400-1R x CS7702R		16	32	85	17	150
12-50	CS8859R x CS7702R		6	14	106	22	148
13-50	CS7990R x CS7702R		13	32	99	31	175
14-50	CS8859R x CS8857R		2	17	55	48	122
15-50	Red McClure x CS7724R		31	29	20	40	120
16-50	CS8907Rus x B 61-3	37				51	882
17-50	CS8907Rus x CS6320	59				111	170
18-50	Cayuga x B 61-3				12	160	172
19-50	B 926-9 x B 61-3					152	152
20-50	B 929-19 x B 61-3					173	173
21-50	627-126 x B 924-19					229	229
22-50	CS8907Rus x B 926-9	37				122	159
23-50	B899-18 x B 61-3					172	172
24-50	CS8827 x B 929-19					143	143
25-50	B 76-23 x B 926-9					147	147
26-50	Menominee x B 61-3					155	155
27-50	B 899-48Rus x B 61-3	54				122	176
28-50	B 899-19 x B 926-9					158	158
29-50	245-121 x B 61-3					170	170
30-50	CS9492 x B 926-9					146	146
31-50	528-229 x B 61-3					114	114
32-50	Ia 46-22-2 x B 874-56R		12	35	38	62	147
33-50	528-229 x B 926-9					85	85
34-50	245-121 x B 926-9					117	117
35-50	245-121 x B 61-3					115	115
36-50	627-126 x B 929-19					96	96
37-50	627-164 x B 61-3					105	105
38-50	CS8546 x B 926-9					118	118
39-50	CS9492 x B 61-3					319	319
40-50	CS6320 x B 926-9					128	128
41-50	245-121 x B 926-9					123	123
42-50	B 76-43 x B 61-3					167	167
43-50	CS8827 x B 61-3					162	162
44-50	627-126 x B 926-9					122	122
45-50	929-19 x CS6320					175	175
46-50	CS9492 x B 926-9					143	143
47-50	CS7961 x B 926-9					112	112
48-50	CS8546 x 245-121					131	131
							7077

Of the older seedlings 192 were planted in 32-hill lots on a tuber-unit basis. All lots were retained at time of harvest for closer study. All of these lots have been carefully examined, and the best lots retained for planting in 1950. Specific gravity readings were also made on the most promising seedlings. Comparative yields of scabby tubers, second growth, growth cracked and tubers without any defects were also recorded (Greeley table 2). Some of these seedlings were free from scab and looked very promising. However, further tests will be necessary to determine their resistance. Dr. Robert Kunkel, of Colorado A and M College, has taken 50 tubers or more of the most promising seedlings for testing at the Colorado State Station. These tubers will be indexed in the greenhouse this winter and planted on a tuber unit basis in the field.

For some reason scab was much more severe on the land devoted to seedling tests in 1949 than in recent years. Commercial varieties and many seedlings were so badly infected with scab as to make them unsalable. Potatoes grown in an experimental spray plot adjacent to the land on which the seedlings were grown produced tubers practically free of scab. The treatment of the land was much the same except that the seedling plot was irrigated with well water and the spray plot was irrigated with river and reservoir water.

Of the older seedlings 30 were planted on a field basis in rows 575 feet long. Some of these seedlings were planted in single rows, whereas others were planted in 2- or 3-row plots. These seedlings were planted on a tuber-unit basis. Most of these seedlings were also badly infected with scab. Some had been considered resistant to scab.

Twenty-eight seedlings and varieties were included in a yield test. A large number of the seedlings included in the test were the same as those tested the previous year, most of the seedlings having been supplied by Dr. Stevenson, and represented some of the most promising seedlings developed in Maine. The plots consisted of 25 hills randomized and replicated 5 times. Of those included in the test, seedlings 61-3, 70-5, 76-43, and 1276-185 were the most promising. Most of the seedlings and varieties were very scabby in 1949. The low specific gravity in 1949 was probably due to the short growing season (Greeley table 3).

Two test plots were located on farms in the early potato section at Gilcrest, Colo. The soil in this section is a sandy loam and well adapted to the growing of the early crop. Most growers of the early crop use large quantities of manure, when available, and commercial fertilizer. Although the seedlings did not have the fine finish in 1949 that they did the previous year, many produced large yields of good type tubers, free from scab, growth cracks, or second growth.

The test plot at Eaton was very unsatisfactory from a cultural standpoint, the land being too steep for good irrigation practices at the upper end of the rows with poor drainage at the lower end of the field. Seedlings 5244 and 6362 were outstanding in the test plot at Ault, Colo. Seedling 5244 is very resistant to scab. It is a late-maturing variety with large vines. The tubers of this seedling are white, cylindrical, with shallow eyes, and generally produces a high percentage of No. 1 tubers on either light or heavy soil. This seedling will be tuber indexed this winter and more extensively tested in 1950.

Greeley table 2. Comparative yields of scabby tubers, second growth, growth cracked and tubers without defects of some of the seedlings potatoes grown at Greeley, Colorado, 1949.

Seedling No.	Percent by weight without defects	Percent by weight with scab	Percent by weight with 2nd growth	Percent by weight growth cracked	Mean Yield per hill	Specific gravity
1111	65.9	19.4	12.4	2.4	2.24	1.0691
3038	85.6	14.4	0	0	2.03	1.0709
5228	79.7	18.9	0	1.3	2.10	1.0692
5244	92.1	7.9	0	0	2.12	1.0726
6320	62.6	33.9	0	3.5	1.44	1.0797
6574-R	73.9	25.6	.5	0	2.16	1.0807
7529	92.9	7.1	0	0	1.65	1.0694
7570	84.9	15.1	0	0	2.30	1.0716
7724-R	79.8	19.0	0	1.2	5.52	1.0825
7961	85.3	14.3	0	.4	1.80	1.0770
8381	79.1	20.1	0	.7	2.31	1.0660
8439-R	73.8	18.1	0	8.0	2.04	1.0847
8581	85.2	14.8	0	0	1.47	1.0749
8780	93.3	6.3	0	.4	1.80	1.0697
8827	90.1	1.6	4.6	3.6	2.38	1.0602
9440	87.7	8.2	1.1	3.0	2.23	1.0745
9551	94.1	0	0	5.9	1.65	1.0866
9887-R	99.6	.4	0	0	1.94	1.0727
9947	89.2	7.7	0	3.1	2.66	1.0774
9964	91.1	6.2	2.7	0	2.02	1.0715
10046	94.2	2.2	0	3.5	2.17	1.0791
10060	88.8	4.2	0	6.9	2.40	1.0840
10065	92.2	5.7	.8	1.2	2.11	1.0834
10082	95.6	2.2	0	2.2	1.95	1.0801
10084	98.5	1.5	0	0	1.84	1.0824
10085	90.3	9.7	0	0	1.57	1.0821
10087	98.1	0	0	1.9	1.98	1.0731
10094	96.0	1.5	1.0	1.5	1.63	1.0859
10099	91.4	2.9	4.6	1.1	1.68	1.0807
10110	82.5	.4	16.2	.9	2.17	1.0659
10113	88.8	9.2	0	1.9	1.98	1.0649
10128	97.0	3.0	0	0	2.17	1.0706
10135	100.0	0	0	0	1.24	1.0817
ND 626-R	65.6	34.4	0	0	.95	1.0720
Katahdin					2.06	1.0880

Greeley table No. 3. Data on yields and specific gravity of named and numbered varieties grown at Greeley, Colo., in 1949. Each variety was grown in 5 plots of 25 hills each in randomized blocks.

Variety	Yield per plot. Mean of 5 replications.	Specific gravity 1/ Mean of 3 replications.
	Lb.	
B 61-3	46.1	1.082
B 69-16	38.4	1.086
Kennebec	47.7	1.088
B 73-3	37.2	1.079
B 73-10	42.4	1.088
B 76-23	38.7	1.083
B 76-43	51.1	1.087
X 96-44	47.2	1.071
X 96-56	43.2	1.065
X 1276-185	41.5	1.075
B 137-5	41.6	1.085
Mohawk	38.4	1.093
Sebago	37.8	1.085
Teton	50.6	1.081
Cayuga	36.8	1.096
Menominee	28.0	1.091
Essex	46.6	1.078
Virgil	33.2	1.084
Placid	39.9	1.089
Pawnee	43.6	1.082
Katahdin	43.3	1.088
Colo. 6316	35.6	1.078
" 6320	31.5	1.091
" 3175	40.4	1.069
Yampa	39.3	1.091
Progress	45.8	1.082
Kasota	47.9	1.078
Triumph	44.1	1.075
Difference for significance at:		
5% level	4.93	
1% "	6.53	

1/ Specific gravity was low in 1949 due to short growing season.

PACIFIC NORTHWEST
John G. McLean

The investigations for 1949 consisted of testing 450 tuber lines and 5,000 seedlings at Aberdeen, Idaho, and 30 varieties at Egin Bench and at Aberdeen for their reaction to Verticillium. Since the Aberdeen plot was quite uniformly infested with scab, readings will be made on the lines and seedlings.

Verticillium: Verticillium wilt is prevalent in the upper Snake River Valley of eastern Idaho. Early-planted fields are 70 to 80 percent infected by mid-August and are mature in early September. Late planting to escape the disease makes the loss hard to estimate but it is believed to cause a 10 to 20 percent loss in the area, except for the Egin Bench of Madison and Jefferson Counties, where the losses are 30 to 50 percent of the crop.

McLean table 1 shows the reaction to Verticillium as measured by foliage symptoms on 21 varieties and seedlings at Aberdeen, Idaho, and under more severe conditions on Egin Bench. Differences in the time of appearance and rapidity of development of foliage symptoms can be noticed (columns 1 and 2), as well as differences between locations (column 3).

McLean table 1. The reaction of 21 lines of potatoes to Verticillium infected at two locations in Idaho.

Line	Index of vine symptoms		
	Egin Bench		Aberdeen
	85 days	120 days	103 days
Cobbler	72	100	100.0
Earlaine	53	100	100.0
46952	48	100	100.0
1276-185	72	100	23.0
B 515-2	72	100	65.0
Kennebec	16	100	58.0
Pawnee	31	100	41.0
Norkota	5	100	
Pontiac	7	15	22.0
Teton	9	100	20.0
Houma	5	94	14.0
White Rose	2	100	16.0
Katahdin	2	61	6.0
Chippewa	23	100	19.0
Green Mountain	4	43	6.0
Russet Rural	1	47	13.0
Mohawk	3	17	4.0
Sebago	1	22	.4
Sequoia	0	0	.8
Menominee	-	-	.4
Russet Burbank	60	100	52.0

A summary of Verticillium symptoms on 360 lines at Aberdeen (McLean table 2) shows the relation of earliness of the strain to the earliness of Verticillium attack (column 1). In each group, however, there appeared to be some lines that were more susceptible or more resistant than the average for the group (columns 2 and 3). In considering the most resistant lines as determined by the maturity group in which they fell, the more consistent resistance seemed to be contributed by Richter's Jubel, Katahdin, and Seedling No. 41956.

McLean table 2. Relation of earliness of potato strains to Verticillium symptoms at Aberdeen, Idaho.(Summary 360 lines).

Maturity	Index of vine symptoms 111 days after planting		
	Average for group	Mean of resistant lines	Mean of susceptible lines
Very early	82.9	72.5	92.5
Early	66.1	31.3	89.0
Early-medium	50.4	22.3	82.4
Medium	37.8	12.7	61.5
Medium-late	27.7	7.9	60.5
Late	11.2	3.0	43.2
Very late	10.0	2.3	28.8

Scab. Scab is a serious problem in most of Idaho. The resistance found in Russet Burbank is sufficient to minimize the problem in many localities. The use of scab-susceptible varieties would not be practicable in most of the upper Snake River Valley. Only the highly resistant varieties, such as Cayuga, Hindenburg, Menominee, Ontario, and Richter's Jubel, were not affected at Aberdeen. Scab pustules were found on Russet Burbank, Russet Rural, Kasota, B 515-2, B 56-9, B 56-11, whereas pitted scab was prevalent on the susceptible varieties.

COLORADO (Ft. Collins)
L. A. Schaal (U.S.D.A.)

The breeding and testing of new lines of potatoes was continued. Crosses were made in the greenhouses at Greeley, Colo., and selections from family lines grown in isolated mountain plots were tested for scab resistance in several places in Colorado. Practically all family lines were crosses involving scab-resistant parent or parents. Several crosses were scab-resistant white on scab-susceptible red. The need for a scab-resistant red potato remains acute in Colorado.

Test plots were planted in fields located in three major potato-growing areas of Colorado, and the soil was known to produce very scabby tubers in previous seasons. Scab more severe than usual, was present in all plots, and thus a good test was obtained from each plot.

Gilcrest, Colo.

This plot was planted in soil in which potatoes had not been grown for 4 years, but this season produced an extremely scabby crop of Bliss Triumph. From Colorado 250 seedling selections, from Iowa 56 selections, 5 named varieties, 2 U.S.D.A. selections, and 1 Michigan selection were planted in 10-hill lots. Bliss Triumph, randomized throughout the plot, were all heavily infected with the deep No. 4 and No. 5 type scab pustules.

Twenty-seven Colorado seedling selections, 9 Iowa selections and 1 U.S.D.A. seedling were saved for further tests (Colo. table 1.) A yield test of

Colo. table 1. Seedling varieties selected from the plots grown at Gilcrest, Del Norte, and Woody Creek, Colo., for further testing.

Seedling or Variety	Tuber color	Saved from plots	Parentage
CS. 6324	White	1	USDA 245-186 x Katahdin
CS. 6330	White	1	USDA 245-186 x Katahdin
CS. 6362	White	1-2 & 3	Katahdin x Menominee
CS. 7137	Red	1-2 & 3	CS. 1491 x B 56-11
CS. 7287	White	1	Menominee x 245-186
CS. 7312	White	1	Katahdin x 245-186
CS. 7364	White	1	Katahdin x Menominee
CS. 7744	White	1 & 3	CS. 1009 x Hindenberg
CS. 7846	Red	1-2 & 3	CS. 3245 x 627-164
CS. 8439	Red	1	B. 56-11 x CS. 2436
CS. 8446	Red		B. 56-11 x CS. 2436
CS. 9028	White	1 & 2	CS. 2436 x 245-25
CS. 9727	Red	1	CS. 3247 x 627-164
CS. 9741	Red	1-2 & 3	Earlaine x 528-170
CS. 9989	White	1	CS. 6330 x CS. 6317
CS. 10143	Red	1	CS. 1485 x Ia. 3942
CS. 10157	Red	1	CS. 1485 x Ia. 3942
CS. 10182	White	1	Menominee x Earlaine
CS. 10185	Russet	1 & 3	CS. 2995 x 627-164
CS. 10241	Red	1	CS. 4471 x Ia. 3942
CS. 10267	Red	1	CS. 4471 x 245-186

(continued)

Contin. Colo. table 1. Seedling varieties selected from the plots grown at Gilcrest, Del Norte, and Woody Creek, Colo., for further testing.

Seedling or Variety	Tuber color	Saved from plots	Parentage
CS. 10275	Red	1	CS. 3529 x 245-186
CS. 10283	Red	1	CS. 3529 x 245-186
CS. 10288	Red	1	CS. 4471 x 627-164
CS. 10383	Red	1	Earlaine x CS. 6316
CS. 10387	White	1	Earlaine x CS. 6316
CS. 10408	White	1	Earlaine x CS. 6317
Ia. 703-1	White	1	
Ia. 707-1	White	1	
Ia. 709-2	White	1	
Ia. 716-1	Red	1	
Ia. 479-1	Purple	1	
Ia. 736-42	White	1 & 2	
Ia. 46-18-1	Red	1	
Ia. 45-6-2	White	1	
Ia. 45-11-7	Red	1	
B. 395-5	White	1 & 2	

Plot 1 - Gilcrest, Colorado
Plot 2 - Del Norte, Colorado
Plot 3 - Woody Creek, Colorado

5 seedling selections in comparison with Russet Burbank and Triumphwere grown on the same field. The data for this test are given in Colorado table No. 2.

Colo. table 2. Yield of 5 seedling and 2 commercial varieties grown at Gilcrest, Colo., 1949.

Variety or No.	Total yield per acre (1)	Yield U.S. No. 1 tubers	Tuber type
	Bu.	Pct.	
Russet Burbank	803	95.0	Good, some oversize.
Bliss Triumph	714	30.0	Fair, (Very scabby. 70%)
CS. 9028	786	96.0	Good.
CS. 6362	778	97.0	Very good, uniform.
CS. 6321	734	92.0	Fair to good.
CS. 8043	680	95.5	Very good, uniform.
CS. 10185	534	97.0	Good.

(1) 74.3 bu. per acre required for significance at 5% point.

Russet Burbank outyielded the Triumph significantly but three of the seedlings were in the same yield class as Russet Burbank.

Del Norte, Colo.

The test at Del Norte was located in the San Luis Valley of Colorado, where Red McClure is grown almost exclusively. In most of this area, scab is not a serious problem. However, certain farms have a very serious scab problem. This section is located in the very fertile Rio Grande River Valley. Here Red McClure scabs very badly. The plot was located on a farm where No. 1 potatoes are few because of scab. Most emphasis was given to testing red tuber varieties, since a red variety is most desired in this area. Two hundred eighty-one named and numbered varieties were grown and the scab reaction and an adaptability index were obtained for each. Colo. table 1 lists the seedlings selected from this plot for further testing. One hundred hills of Yampa, from seed grown on this farm for 7 consecutive years, showed no virus disease.

Woody Creek, Colo.

This test plot was planted in soil that is severely infested with scab. The races found here differ from those found in other areas and is very virulent on most varieties of potatoes. Seedling C.S. 9741 produced practically scab-free tubers. This seedling is light red and appears to produce fair to good yield. The color is undesirable, but it is highly resistant to the races of Actinomyces present in this soil. This seedling is darker red and produced a good yield of well-shaped tubers in this plot. From this plot containing 56 seedling selections, 6 selections were saved for further testing (Colo. table 1.)

Montrose, Colo.

This plot was grown cooperatively with the Montrose County Potato Improvement Committee and Mr. Fred C. Carlson. High yields are usually obtained in this potato-growing area located in the Uncompahgre Valley of western Colorado. Harvest data were obtained by Mr. Wm. Stewart, county agricultural agent of Montrose County.

Colo. table 3 gives results of this test plot. C.S. 6324 produced the highest yield. This seedling selection is from the same cross from which Yampa was obtained. C.S. 5244 also produced a high yield, and this selection has shown promise for several years in the heavier soils. Iowa selections 45-3-2 and 46-18-1 produced high yields of attractive red tubers. Of the 4 named varieties, Mohawk was the most desirable.

Colo. table 3. Adaptability and yield test of 24 seedling selections and 4 named varieties. Montrose, Colo. Planted June 11; harvested November 3, 1949.

Variety Name or No.	Yield per acre*	Tuber Color
	Bu.	
C.S. 6324	822	W
C.S. 5244	772	W
C.S. 10182	750	W
Ia. 45-3-2	725	Red
C.S. 8043	720	W
Mohawk	710	W
Ia. 46-18-1	618	Red
C.S. 7702	568	Red
C.S. 6321	568	W
C.S. 6403	565	W
Ia. 45-11-7	563	Red
C.S. 7846	515	Red
C.S. 8446	488	Red
C.S. 7308	465	W
C.S. 9728	458	W
C.S. 7137	458	Red
C.S. 7724	448	W
C.S. 6362	440	W
C.S. 10185	397	Russet
C.S. 7744	388	W
C.S. 9775	385	W
C.S. 9028	367	W
Seneca	355	W
Essex	305	W
C.S. 6344	287	W
C.S. 7364	273**	W
Placid	243**	W
C.S. 8053	122**	W

*Yield figured on basis of single plot of 25 + hills.
**Poor Stand.

USDA, NORTH-CENTRAL PROJECT

Orrin C. Turnquist

The investigations for 1949 in the North-Central Potato-Breeding project can be divided into five phases: growing first-year seedling family lines, observation of promising selections, yield tests of commercial varieties and advanced selections, increase of promising selections and varieties, and cultural studies. The work was conducted at the Potato Research Farm, Grand Forks, N. Dak., at a private farm at Oklee, Minn., and at the Fruit Breeding Farm at Excelsior, Minn. Headquarters for the project was at University Farm, St. Paul, Minn. This work was in cooperation with the States of Minnesota, North Dakota, Iowa, Nebraska, Wisconsin, and Michigan; the Red River Valley Potato Research Center; and the U.S.D.A. at Beltsville, Md., Presque Isle, Maine, and Greeley, Colo.

First-Year Seedlings

At Oklee, Minn., 121 first-year seedling family lines were grown. These seedlings were obtained from the greenhouses at Beltsville, Md., Fargo, N. Dak., and Greeley, Colo. Of the 11,315 individual seedlings grown, 74 selections were made for the 1950 tests: 56 will be tested for scab reaction, 45 for late blight, 17 for ring rot, 18 for resistance to virus A, 12 for resistance to virus Y, and 2 for immunity to virus X. An attempt was made to select individuals that were early in maturity.

Observation Plots

An observation plot of 160 5-hill rows was grown at Grand Forks, N. Dak., consisting of promising selections from Presque Isle, Maine, and from Iowa, Minnesota, North Dakota, Nebraska, Michigan, and New York, and 50 named varieties. The following selections appeared promising as far as general observation was concerned: 46952, B 73-16, B 76-23, B 89-2, B 351-44, B 385-5, B 529-73, B 595-76, B 598-29, B 616-10, B 904-7, B 929-32, B 958-7, N.D. 148-84, Nebr. 49.40-1, Nebr. 130.43-2, Nebr. 204.43-1, Nebr. 217.43-1, and Nebr. 225.43-1.

Yield Tests

The yield tests were all made at Grand Forks, N. Dak. The data for yield, percentage U. S. No. 1 size, and specific gravity are given in Turnquist tables 1 to 4. Where enough seed was available the test included six replicates. The other three tests included three replicates only. In each test Irish Cobbler was grown to provide a standard. No attempt was made to remove the vines before harvest. All the vines were green except those of the early varieties indicated in Turnquist table 2. Kennebec yielded significantly higher than any other variety in test No. 1 (Turnquist table 1). Although this variety has a late vine the tubers are set as early as in our early-maturing varieties. It produced a very good set of large attractive tubers. Selection B 61-3 and Pontiac yielded significantly higher than Irish Cobbler, but Pontiac was significantly lower in specific gravity. Selection B 73-10 was in the same class as B 61-3 in yield and specific gravity but it produced the highest percentage U. S. No. 1 size tubers in the test. Progress yielded significantly lower than Pontiac,

Turnquist table 1. Yield, percentage of U.S. No. 1, and specific gravity of 20 varieties and seedlings at Potato Research Farm, Grand Forks, N. Dakota, 1949 *

Variety	Yield of U.S. No. 1 tubers per acre	U. S. No. 1 size	Specific gravity
	Bu.	Pct.	
Kennebec	434	95	1.065+
Houma	384	93	1.076+
Warba	383	93	1.067+
Teton	376	95	1.065+
Pontiac	374	96	1.060+
Chippewa	373	93	1.062+
B 61-3	365	94	1.073
B 73-10	354	98	1.070
X 1276-185	348	95	1.072
B 137-5	340	93	1.062
Green Mountain	337	91	1.081+
Marygold	328	94	1.067+
Red Warba	326	94	1.067+
Irish Cobbler	323	93	1.070+
Progress	322	88	1.073+
B 75-4	312	95	1.068
Sebago	311	93	1.057
Katahdin	303	96	1.068+
Mohawk	301	97	1.076+
Sequoia	300	96	1.067+
L.S.D.	39	-	.008

* This yield test was planted in 6 randomized blocks of 25 hills per plot.

and although the specific gravity was high it yielded the lowest percentage of U. S. No. 1 size tubers.

The data for yield, percentage of U.S. No. 1 size, and specific gravity for 14 early-maturing varieties are given in Turnquist table 2. The variety Chisago was the highest-yielding but not significantly different from Irish Cobbler. It produced a high percentage of very attractive, smooth U. S. No. 1 size tubers that were definitely superior to the Irish Cobbler. The latter, however, was significantly higher in specific gravity. Selection 46952 was in the same class as Irish Cobbler as far as yield is concerned but it is significantly lower in specific gravity. This selection produced a good set of large, smooth, attractive tubers.

Turnquist table 3 gives the yield, percentage of U. S. No. 1 size, and specific gravity of 24 midseason and late varieties and selections.

Turnquist table 2. Yield, percentage of U. S. No. 1 size, and specific gravity of 14 early varieties and seedlings at Potato Research Farm, Grand Forks, North Dakota, in 1949. *

Variety	Yield of U.S.#1 tubers per acre	U.S. #1 size	Specific gravity
	Bu.	Pct.	
Chisago	435	98	1.066
Earlaine	413	94	1.067
Pawnee	410	96	1.073
Irish Cobbler	409	96	1.078
N.D. K-5	401	94	1.065
Mesaba	396	92	1.066
Lasoda	389	97	1.067
46952	386	97	1.062
Bliss Triumph	384	96	1.067
X 96-56	333	95	1.073
Lasalle	318	95	1.072
Waseca	311	95	1.062
X 96-44	310	96	1.072
B 402-1	290	90	1.068
L.S.D.	57	--	.009

* This yield test was planted in 3 randomized blocks of 25 hills per plot.

Turnquist table 3. Yield, percentage U.S.#1, and specific gravity of 24 varieties and seedlings at Potato Research Farm, Grand Forks, N.D., 1949.*

Variety	Yield U.S.#1 tubers per acre	U.S. #1	Specific gravity
	Bu.	Pct.	
B 69-16	430	97	1.069
Irish Cobbler	407	96	1.064
47258	402	95	1.054
Minn. No. 21	401	98	1.068
Essex	392	95	1.052
Red Pontiac	389	97	1.059
B 351-44	376	96	1.065
Kasota	363	95	1.056
Rural New Yorker	352	96	1.072
Satapa	343	96	1.063
Erie	336	95	1.056
White Rose	329	96	1.060
Russet Rural	323	96	1.065
Cayuga	323	91	1.070
Norkota	319	93	1.062
Russet Sebago	314	94	1.052
Seneca	304	96	1.056
Potomac	297	94	1.059
Menominee	295	96	1.065
Golden	279	86	1.048
B 76-23	275	97	1.067
Russet Burbank	271	92	1.066
Calrose	241	88	1.056
Ontario	236	90	1.055
L.S.D.	49	--	.010

* This yield test was planted in 3 randomized blocks of 25 hills per plot.

Selection B 69-16 was the highest yielding in the group with a high percentage of U. S. No. 1 size tubers. The yield, however, was not significantly different from that of Irish Cobbler. Essex, or Red Pontiac, Selections Minn. 21 and 47258 were also in the top-yielding group. Ontario was the lowest-yielding in the group and produced a large number of tubers in chains. Most of these tubers did reach a 1 7/8-inch minimum size.

Turnquist table 4 gives the yield, percentage of U. S. No. 1 size, and specific gravity of 24 selections compared with Irish Cobbler. Selection B 73-2 was the highest yielding, being significantly higher than Irish Cobbler with more U. S. No. 1 size tubers and similar specific gravity reading. Eleven selections were significantly lower than Irish Cobbler. Selection B 91-4 was the highest in specific gravity being significantly higher than all except B 73-18. B 91-4 set too many tubers in the hill, resulting in a lower yield of U. S. No. 1 size tubers, whereas selection B 73-18 was in the same yield class as Irish Cobbler.

Increase Plots

At Oklee, Minn., a farm was secured that furnished excellent isolation for increase of seed stock. In addition to the first-year greenhouse seedlings discussed previously, 390 5-hill rows of selections and varieties were also grown on this farm. These plots were rogued regularly for disease from the time the plants were 6 inches tall.

Cultural Studies

At the Potato Research Farm at Grand Forks a spacing test was made. This test included 10 varieties at 6-, 9-, 12-, 15-, and 18-inch spacings within the row. This plot was a split-plot arrangement with 4 replications. The analysis of variance indicated no significant interaction between varieties and spacings. With the exception of Irish Cobbler the varieties tested yielded significantly more at the closer spacings. There was a tendency to produce more U. S. No. 1 size tubers at the wider spacing. A 113-bushel differential in the yield occurred in Red Warba between the 6- and 18-inch spacings. Minnesota 23, another early variety, had a 104-bushel differential between the two extreme spacings. Pontiac, Kennebec, and Teton significiantly outyielded the Bliss Triumph and Irish Cobbler on all spacings. Moisture conditions were adequate during the entire course of the experiment.

At the Fruit Breeding Farm at Excelsior, Minn., an experiment was laid out in cooperation with the Division of Horticulture, University of Minnesota, to determine the effect of 2,4D on potatoes. Ten varieties were treated with 2 pounds of 2,4D per acre at three different dates of application. The experiment was laid out as a split plot with four replications. The potatoes were planted on May 3. The applications were made on June 6 when the plants were 6 to 8 inches tall, on June 20 when they were 12 to 14 inches tall, and in the early bud stage, and on July 11 when in full bloom. As an average of the 10 varieties the application of 2 pounds of 2,4D per acre reduced yields regardless of the time of application (Turnquist table 6.). This yield reduction amounted to approximately 20 percent. The variation in yields for individual varieties for the various treatments was too variable to draw any definite conclusions. The variation in yield was undoubtedly due to a severe infestation of cutworms early in the season

resulting in a very irregular stand. There was a tendency toward a lower percentage of No. 1 size tubers with the treatment, but there was no apparent effect on specific gravity (Turnquist tables 7 and 8). Observations on the effect of 2,4D on color of red potatoes indicated that plants 4 to 6 inches high tended to result in fading of the red skin color, whereas treatment in full bloom stage resulted in an intensification of red color.

Turnquist table 4. Yield, percentage of U. S. No. 1 size, and specific gravity of 24 seedlings at Potato Research Farm, Grand Forks, N. Dak., in 1949 *.

Variety	Yield of U.S. #1 tubers per acre	U.S. #1 size	Specific gravity
	Bu.	Pct.	
B 73-2	435	98	1.070
B 529-88	399	95	1.061
B 76-43	386	95	1.064
B 515-2	386	97	1.055
B 62-1	379	91	1.066
Irish Cobbler	369	95	1.069
N.D. 148-84	352	97	1.062
B 73-18	340	98	1.081
B 447-98	318	92	1.067
B 73-3	313	96	1.072
B 73-16	312	96	1.069
N.D. 530	307	89	1.074
B 89-2	306	89	1.072
B 529-73	300	96	1.069
B 70-4	293	89	1.071
B 355-44	289	95	1.075
B 76-33	266	86	1.077
B 91-4	253	88	1.089
B 590-7	251	96	1.061
B 792-88	237	79	1.073
B 287-8	237	94	1.062
N.D. 626	215	93	1.058
B 483-14	146	77	1.065
N.D. 530-5	189	97	1.067
L.S.D.	63	--	.010

* This yield test was planted in 3 randomized blocks of 25 hills per plot.

Turnquist table 5. Yield and percentage of U.S. No. 1 size tubers of 10 varieties at five different spacings at Potato Research Farm, Grand Forks, North Dakota, in 1949 *

Variety	Yield of U.S. #1 tubers per acre and spacing					U. S. No. 1 size and spacing				
	6-in.	9-in.	12-in.	15-in.	18-in.	6-in.	9-in.	12-in.	15-in.	18-in.
	Bu.	Bu.	Bu.	Bu.	Bu.	Pct.	Pct.	Pct.	Pct.	Pct.
Pontiac	385	364	351	336	328	94	96	94	96	96
Kennebec	368	364	373	320	323	92	92	94	95	94
Teton	363	378	318	329	295	90	95	95	95	94
Satapa	326	330	328	290	312	90	93	93	93	94
Red Warba	365	296	279	259	252	92	92	95	93	92
Chisago	320	294	255	245	248	91	92	94	93	95
Minn. No.23	330	294	267	236	226	97	96	97	98	98
Waseca	287	288	249	238	233	93	95	94	95	97
Bliss Triumph	296	262	262	244	220	93	94	93	94	94
Irish Cobbler	246	298	243	258	237	88	94	92	94	95

L.S.D. between varieties 36 bu.
L.S.D. between spacings 17 bu.

* This experiment was a split plot design with 4 replicates of 30-foot plots of each variety at each spacing.

Turnquist table 6. Yield of 10 varieties of potatoes sprayed and unsprayed with 2,4D at the rate of 2 lb. per acre at three stages of growth in 1949*

Variety	Yield per acre and date of spraying				Mean	L.S.D.
	Unsprayed	Sprayed June 6	Sprayed June 20	Sprayed July 11**		
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Kennebec	466	403	329	375	393	138
Pontiac	374	402	366	273	354	138
Chippewa	408	282	261	267	304	138
Satapa	325	238	267	332	291	138
Irish Cobbler	311	220	327	249	277	138
Teton	250	205	276	243	254	138
Waseca	287	168	162	287	215	138
Red Warba	285	182	122	244	208	138
Bliss Triumph	135	159	192	145	158	138
Chisago	174	170	139	126	152	138
Mean	302	243	244	254		43
L.S.D.	93	93	93	93	47	

* This experiment was a split-plot design with 4 replicates of 20 hills per plot.

** Potatoes planted May 3; 6-8" tall on June 6; 12-14" tall on (early bud stage) June 20; full bloom on July 11 for most varieties.

Turnquist table 7. Percentage U.S. No. 1 tubers of 10 varieties of potatoes sprayed and unsprayed with 2,4D at the rate of 2 lb. per acre at three stages of growth in 1949 *

Variety	Percentage U.S. No. 1 size				
	Unsprayed	Sprayed June 6	Sprayed June 20	Sprayed July 11**	Mean
	Pct.	Pct.	Pct.	Pct.	Pct.
Kennebec	96	96	96	96	96
Pontiac	94	91	92	95	93
Chippewa	93	91	88	89	90
Satapa	91	89	90	87	89
Irish Cobbler	92	86	89	86	88
Teton	91	88	90	90	90
Waseca	92	82	88	90	88
Red Warba	93	80	76	83	83
Bliss Triumph	83	85	84	83	84
Chisago	88	88	83	87	86
Mean	91	88	88	89	

* This experiment was a split plot design with 4 replicates of 20 hills per plot.

** Potatoes planted May 3; 6-8" tall on June 6; 12-14" tall on (early bud stage) on June 20; full bloom on July 11 for most varieties.

Turnquist table 8. Specific gravity of 10 varieties of potatoes sprayed and unsprayed with 2,4D at the rate of 2 lb. per acre at three stages of growth in 1949 *

Variety	Specific gravity and date of spraying				
	Unsprayed	Sprayed June 6	Sprayed June 20	Sprayed July 11**	Mean
Kennebec	1.066	1.068	1.066	1.064	1.066
Pontiac	1.058	1.054	1.056	1.058	1.056
Chippewa	1.064	1.062	1.060	1.063	1.062
Satapa	1.054	1.057	1.053	1.053	1.054
Irish Cobbler	1.070	1.072	1.071	1.069	1.070
Teton	1.068	1.071	1.064	1.063	1.066
Waseca	1.059	1.056	1.056	1.056	1.057
Red Warba	1.061	1.056	1.052	1.058	1.057
Bliss Triumph	1.063	1.064	1.060	1.063	1.063
Chisago	1.063	1.064	1.058	1.060	1.061
Mean	1.063	1.062	1.060	1.061	
L.S.D.					.002

* This experiment was a split-plot design with 4 replicates of 20 hills per plot.

** Potatoes planted May 3; 6-8" tall on June 6; 12-14" tall on (early bud stage) June 20; full bloom on July 11 for most varieties.

CALIFORNIA

Glen N. Davis

Test for Resistance to Verticillium Wilt

One hundred thirty-five varieties and seedlings were planted at Hollister to test for resistance to verticillium wilt. The plot was planted on June 9, and readings were made on August 31 and October 10. Readings were made by pulling the plants and cutting the stems about the ground line with a sharp knife. Discoloration of the vascular tissue indicated the presence of the verticillium organism. In most cases infection was severe. In a few there was considerable less discoloration, but the presence of the organism was evident. In one variety and three numbered lines (Iduna, B 529-88, B 595-76 and 25673) no discoloration was evident and infection was questionable. It is hoped these four lines can be given further tests.

Readings are given in the following table.

S = severe discoloration, M = slight discoloration, Tr = Trace

Variety	Hills	Verticillium Reading	Variety	Hills	Verticillium Reading
	No.			No.	
Ackersegen	6	S	Kasota	10	S
Allison	10	S	Katahdin	10	S
Arnica	6	S	Kennebec	7	S
Ashworth	6	S	La Salle	10	M
Calrose	8	S	Marygold	6	M
Cayuga	5	S	Matador	6	S
Chenango	9	S	Menominee	8	S
Chippewa	8	M	Mesaba	6	S
De Soto	9	S	Mohawk	9	S
Eigenheimer	6	S	Noordeling	4	M
Empire	8	M	Norkota	8	S
Erdgold	6	S	Ontario	5	S
Erie	6	S	Parnissa	6	M
Earlaine	6	M	Patomac	8	S
Essex	6	M	Placid	10	S
Fillmore	6	S	Pontiac	9	M
Flava	6	M	Pawnee	10	S
Friso	5	S	Red Warba	4	M
Garnet Chili	8	S	Record	6	M
Golden	6	M	Rheingold	6	S
Green Mtn.	8	S	Richter's Jubel	6	S
Hindenburg	6	S	Robusta	8	S
Houma	6	S	Russet Burbank	6	S
*Iduna	6	Tr?	Russet Rural	6	S
Irish Cobbler	7	S	Sebago	6	S
Seneca	8	S	B 904-7	6	S
Sequoia	6	S	B 904-8	6	S
Snowdrift	7	S	2 BN-7	6	S
Teton	6	S	2 FA-12	6	S

Variety	Hills	Verti-cillium Reading	Variety	Hills	Verti-cillium Reading
Thorbecke	6	S	2 MI-6	8	S
Triumph	9	S	2 QZ-1	8	S
Virgil	8	S	2 VH-4	5	S
White Rose	10	S	CS 6317	8	S
B 61-3	6	S	EK-2	6	M
B 62-1	5	S	FBY-4	3	S
B 69-16	9	S	X 590-7	6	S
B 70-4	6	S	96-44	8	S
B 73-2	6	S	96-56	6	S
B 73-3	10	S	792-88	6	S
B 73-10	10	S	1276-185	9	M
B 73-18	9	S	25668	8	S
B 76-23	10	S	25669	8	S
B 76-33	8	S	25670	7	S
B 76-43	6	S	25671	9	S
B 89-2	6	S	25672	6	S
B 91-14	6	M	*25673	5	Tr
B 137-5	6	S	25674	7	S
B 385-5	6	S	25675	5	S
B 395-5	6	S	25676	6	S
B 395-13	6	S	25677	8	S
B 402-1	8	S	25678	5	S
B 461-32	6	S	25679	6	S
*B 529-88	8	Tr?	25680	7	S
B 531-44	8	M	25681	8	M
B 594-15	10	M	25682	6	S
*B 595-76	7	Tr?	25683	10	S
B 598-29	6	M	25684	9	S
B 759-2	6	M	25685	9	S
B 759-26	6	M	25686	5	S
B 759-34	6	S	25687	6	S
B 773-8	7	M	25688	7	S
B 773-21	4	M	25689	5	S
B 791-36	3	S	25690	6	S
B 879-1	6	S	25691	6	S
B 879-14	6	M	25692	10	S
B 892-4	6	S	41956	6	S
B 899-38	6	M	46952	6	M
* Highly resistant to verticillium.			47258	6	S

Potato Variety Yield Test - Shafter, Calif. 1949

Fourteen varieties of potatoes were planted in the yield test plot at Shafter in 1949. Five replications of 25 hills each were planted of each variety. The data are given in the following table.

Calif. table 2.

Variety	Mean yield per Plot
Ontario	69.4
Kennebec	64.8
Menominee	72.2
Houma	77.5
Katahdin	69.6
Teton	75.4
Cayuga	69.4
Sebago	73.6
Pontiac	76.2
B 73-18	77.8
B 402-1	69.8
1276-185	87.7
B 61-3	70.6
B 76-43	77.3

Least significant difference = 10.6 ✓
Least highly " " = 14.1

Cuba

Manuel M. Tamargo

When the samples were received they were given to Dr. S. C. Bruner, Head of the Pathology and Entomology Department. In three visits to the field I found no virus diseases in the varieties sent by the U. S. D. A., but two other varieties were severely affected with purple top and rugose mosaic. The potatoes were planted on December 27, 1948. The Kennebec and Triumph were harvested March 24, 1949, but the Sebago was not harvested until April 20.

The Sebago variety showed a high resistance to early blight (Alternaria) but the Triumph was very susceptible. The Kennebec was intermediate. During the entire season the weather was very dry so that late blight did not affect the results. The data for yield and percentage of U. S. No. 1 tubers as found for 3 varieties tested in Cuba in 1949 are given in Cuba table 1.

Cuba table 1. Yield of 100 plants in pounds of U. S. No. 1 based on that of 100 plants to each plot.

Variety	Plots			Total
	1	2	3	
Kennebec	51.89	59.87	67.45	179.21
Bliss Triumph	50.21	48.69	51.15	150.05
Sebago	12.10	5.05	8.16	25.31

Total weight of tubers based on yield of 100 plants in each of the three plots:

Kennebec 195.5
Bliss Triumph ... 184.6
Sebago 72.3

Percentage of U. S. No. 1 in the total yield:

Kennebec 91.2
Bliss Triumph ... 81.4
Sebago 35.2

Number of plants in the three plots of each variety at time of harvest:

Kennebec 344
Bliss Triumph ... 340
Sebago 314

There was no significant difference between Kennebec and Triumph but a highly significant difference between these two and Sebago. The Kennebec produced a few more U. S. No. 1 potatoes than the Triumph, but almost two-thirds of the Sebago did not reach the U. S. No. 1 size. It is evident that the Sebago variety is not well adapted to the soil at the experiment station at Santiago de las Vegas, but elsewhere in Cuba growers have been obtaining satisfactory results with the Sebago variety.

Samples of Kennebec and Triumph potatoes were given to eight different persons. Their reports showed that all eight agreed that the flavor of the Kennebec was good; rather superior to the flavor of the Triumph.

FLORIDA

A. H. Eddins, E. N. McCubbin and R. W. Ruprecht

Hastings, Fla.

Fourteen varieties and crosses were tested for yield in replicated plots at Hastings. They were sprayed 10 times with dithane D-14-zinc sulfate-25% DDT emulsion (2 qts.-1 lb.-1 qt.-100 gals.) at 150 gallons per acre at intervals of every 4 to 6 days during the last 6 weeks of the growing period.

Seven selections significantly outyielded the standard variety, Sebago (table 1).

Table 1. Yields of 14 seedling crosses and varieties of potatoes grown at Hastings, Fla., in 1949.

Variety or Seedling Cross*	U. S. No. 1 size A tubers per acre	
	Total	Increase over Sebago
	Bu.	Bu.
B 76-43	436	88
Kennebec	434	86
B 61-3	432	84
Dakota Chief	423	75
B 351-44	423	75
X 96-56	405	57
B 69-16	381	33
Marygold	371	23
B 137-5	354	6
Sebago	348	--
B 447-98	337	-11
B 287-8	295	-53
B 142-7	271	-77
B 75-4	219	-129
Least Significant Difference		29

* Five replicates of each grown in 25-foot, single-row, randomized plots 40 inches apart.

The three highest yielders were B 76-43, Kennebec, and B 61-3. Differences in yields of Sebago, Marygold, B 137-5, and B 447-98 were not significant; and B 287-8, B 142-7 and B 75-4 yielded significantly less than Sebago.

Tubers of B 447-98, Dakota Chief, and Marygold were more mature than those of the other 11 selections when dug 97 days after planting. Lenticels were most prominent on tubers of Sebago and least prominent on tubers of B 76-43 and B 61-3. Tubers of Sebago and Kennebec were free from knobs and cracks.

Late-blight Resistance and Yields of Four Varieties.- Sebago, Kennebec, Dakota Chief, and Marygold were grown in Latin square plots, and their yields and reaction to late blight compared. The potatoes were sprayed once with dithane D-14-zinc sulfate. Late blight was not observed in the tops and tubers of Kennebec but it killed 92 to 98 percent of the foliage of plants of the other three varieties and 0.7 to 2.4 percent of their tubers were infected. All varieties significantly outyielded Sebago. Kennebec ranked first with a yield of 339 bushels

U. S. No. 1 size A tubers per acre, which exceeded that of Sebago by 176 bushels. Early-maturing Dakota Chief and Marygold produced more marketable tubers than Sebago before their tops were killed by blight and thus outyielded the latter by 20 to 77 bushels per acre, respectively.

Sanford, Fla.

Twelve varieties and crosses were grown in replicated plots at Sanford and protected against late blight by regular applications of dithane-zinc sulfate spray.

Five selections significantly outyielded Sebago by 51 to 100 bushels per acre (table 2). Three of these, Dakota Chief, Kennebec, and B 76-43 also ranked among

Table 2. Yields of 12 seedling crosses and varieties of potatoes grown at Sanford, Fla., in 1949.

Variety or Seedling Cross*	U. S. No. 1 size A tubers per acre	
	Total	Increase over Sebago
	Bu.	Bu.
Dakota Chief	404	100
Marygold	391	87
Kennebec	358	54
B 137-5	357	53
B 76-43	355	51
B 447-98	330	26
B 61-3	315	11
X 96-56	313	9
Sebago	304	--
B 69-16	272	-32
B 142-7	214	-90
B 75-4	138	-166
Least Significant Difference		51

* Five replicates of each grown in 25-foot, single-row, randomized plots 30 inches apart.

the four best yielders at Hastings (table 1). There were no significant differences in yields of B 447-98, B 61-3, X 96-56, B 69-16, and Sebago at Sanford. B 142-7 and B 75-4 were the lowest yielders at both Sanford and Hastings.

FLORIDA (Belle Glade)

D. L. Stoddard

The 10 varieties of potatoes sent to me by the USDA were planted on sandy soil near Indiantown in October, 1948. There was no rain. The soil was so dry that there was no germination at first. Irrigation didn't seem to help. Germination started eventually. The vines seemed to be growing well but were mostly killed by frost on January 2. Some of the vines persisted and by February 15 there was enough late and early blight to make some sort of a reading. Yield records were not taken.

Stoddard table 1 gives the data on late blight, early blight, and bacterial wilt on the 10 varieties grown.

Stoddard table 1. Data on late blight, early blight, and bacterial wilt on the 10 varieties grown at Indiantown, Fla., in the fall of 1948 and winter of 1949.

Variety	Late Blight	Early Blight	Bacterial Wilt
Kennebec	None	Slight	None seen
76-23	None	Moderate	Yes
76-43	None	Slight	Yes
87-1	Severe	?	None seen
Pontiac	Very Severe	?	None seen
69-16	Very slight	Moderate	None seen
Triumph	Very severe	?	?
Sebago	Very severe	?	?
75-4	None	Slight	Yes
61-3	None	Severe	None seen

IOWA

C. E. Peterson and W. J. Hooker

Seed Production

Most of the crosses made during the late winter and early spring of 1949 were combinations that included resistance to scab and late blight. If the parents available had resistance to other diseases they were included as far as possible. Most of the parents used were selections from the USDA Potato Field Station at Presque Isle, Maine. A few early, scab-resistant selections from Dr. F. A. Krantz and some highly colored red selections from Dr. H. O. Werner were also used as parents. Some of the blight-resistant varieties introduced by Dr. Reddick were included in some of the crosses. A total of 104 different parental combinations were made. Conditions for flower and seed production were good and a heavy yield of seed was secured. Remnant seed is on hand for most of the crosses made.

Greenhouse Seedling Crop

From the 104 crosses mentioned above slightly over 23,000 seedlings were grown in 3-inch pots in the greenhouse. These were harvested during the first 2 weeks of November and after some selection there are approximately 18,000 seedling tubers available for planting to the field in the spring of 1950. Another 10,000 B-size tubers are available for distribution.

The Botrytis (sp.) problem has become increasingly severe during the past two seasons. The only way we were able to save the seedling crop was to continually remove yellow leaves to prevent their dropping and decaying on the surface of the pots.

Field Work in 1949

Field plantings in Iowa were all on muck soil near Clear Lake. This soil is typical of the potato-producing area, and scab is a serious problem. Approximately 14,000 first-year hills were grown from the 1948-49 greenhouse seedling tubers. These represented over 100 parental combinations. A few progenies were outstanding from the standpoint of providing a high percentage of selections. The best family lines will be replanted in larger numbers to provide a better chance for selection. Single hill selections totaled 640, or approximately 4.6 percent of the total of 14,000.

Also included in field plantings were 5-hill observation rows of 404 selections and 14 varieties. Of the selections 47 were saved for further tests. In addition to the observation rows in Iowa, duplicate plantings of 147 Iowa selections were planted for seed increase at Oklee, Minn. These seed plots were planted by O. C. Turnquist. Seed plots at Grand Rapids, Minn., were again maintained by the Iowa Station. In these plots, 23 selections and new varieties were increased in quantities sufficient for adaptability trials in 1950.

The results of the yield trial at Clear Lake are presented in Iowa table 1.

Variety or selection	Yield US #1 per acre 1/	Maturity	Scab type 2/	Specific gravity	Notes
	Bu.				
45-10-6	556	L	3	1.063	
44-16-1	550	L	2	1.072	
Kennebec	544	L	3	1.067	4% Moderate growth cracks
X 38-4	525	L	2	1.075	Sprouting by 11/15
Sebago	511	L	2	1.070	
CS 6392	498	M	2	1.063	
X 26-8	496	M	1	1.069	Red
44-33-2	494	E	1	1.081	
45-12-4	488	L	2	1.056	Red.
Cobbler	486	E	3	1.065	
CS 6316	482	M	1	1.066	14% Hollow heart
B 61-3	447	M	1	1.073	
Kasota	439	M	3	1.064	Pink
44-8-4	436	E	1	1.079	
Yampa	422	L	1	1.065	15% Severe growth cracks
X 29-2	418	L	1	1.058	
B 601-1	408	L	1	1.063	
B 596-7	360	M	1	1.061	
45-12-12	261	M	3	1.065	
Least Significant Differences P -- .05	69 bu.			.0032	
P -- .01	92 bu.			.0044	

1/ Yield figures are averages for 5 plots of 25 hills for each variety.

2/ Type 1 - slight (russet) type of surface scab.
2 - raised or slightly pitted type.
3 - pitted scab.

The influence of an unusually hot, dry period during August is evident in the data for yields and specific gravity. In 1948 Kennebec yielded 631 bushels per acre compared with 481 bushels for Cobbler. This year Kennebec again outyielded Cobbler, but the difference (58 bushels) was not significant. B 61-3 also failed to perform as well in 1949 as it did the preceding year. The 1949 season in Iowa was also a good test year for varieties and selections with any tendency to develop growth cracks or hollow heart. Yampa developed severe growth cracks for the first time in 5 years on the muck soils of northern Iowa. About 15 percent of the tubers were unmarketable because of growth cracks. Seedling 6316 produced the most attractive tubers of any variety in the test, and the yield was not significantly below Cobbler. However, this selection developed 14 percent hollow heart. This is the first year that hollow heart has been observed in this selection. Kennebec developed a few growth cracks (4 percent), but they were not severe as in the case of Yampa.

Specific gravity readings were unusually low compared with those of normal years. The early varieties were much lower than normal whereas most of the late varieties were near their readings for the preceding year. Apparently

the late varieties continued to increase in density after the advent of rains and cooler weather in September. At any rate, this is the first year we have observed Sebago with a higher specific gravity than that of Cobbler. The difference in favor of Sebago is highly significant statistically.

Vine Killing

Growers in Iowa are reluctant to accept late varieties. Their objections are because their harvest must be done later in the fall and the problem of late vines interferes with digging operations. Iowa table 2 shows the results of a vine-killing test at Clear Lake in 1949. A high incidence of stem end discoloration in Cobbler has been reported by growers. According to the data discoloration was increased by mechanical vine removal in the Cobbler variety. In general, vine killing reduced yields to a greater extent in the later varieties. Discoloration was increased significantly by either mechanical or chemical vine killing. It is interesting to note the high incidence of discoloration observed in the check plots, and the differences in varietal incidence of stem end discoloration which occurred under the extreme conditions existing during this season. The 2, 4-D treatment resulted in no significant reduction in yield; it did not increase discoloration compared with check plots, and it hastened maturity of vines by about 10 days.

These results indicate wide differences among varieties in their tendency to develop stem-end discoloration due to weather conditions or vine-killing practices. This year Kennebec could have been killed either chemically or mechanically without inducing a higher incidence of discoloration than that which occurred in untreated Cobbler.

Late Blight

Evaluation of seedling plants for resistance to late blight, Phytophthora infestans, was continued. Twenty four progenies from crosses in which one or both parents possessed W-type resistance to late blight were compared with two progenies with neither parent resistant. An isolate of P. infestans that had been collected in Iowa was used in 3 replications. The percentage of survivors in 17 progenies, in which both parents possessed W resistance, ranged from 38 to 71. Of these progenies 12 had more than 55 percent surviving inoculation, whereas when only 1 parent was resistant the percentage of survivors ranged from 32 to 48 in the 5 progenies tested. No plants survived when both parents were susceptible. Another strain of P. infestans (#583), supplied by Dr. E. S. Schultz, destroyed all these seedling progenies in a similar inoculation trial. Additional tests with this isolate are necessary because subsequent tests with seedlings have not been in complete agreement. The isolate is considerably more severe on mature plants of a number of resistant progenies than is the Iowa isolate.

Survivors of late blight inoculation in the seedling stage have been grown in the field and are being tested for late blight resistance in order to determine the effectiveness of the seedling tests.

Iowa table 2. Yields and stem-end discoloration in vine-killing experiment, Clear Lake, Iowa, 1949. All plots harvested September 17.

Variety	2, 4-D 2 lb/A[1]		Sod.Salt 7/12 [2]		Mechanical Kill 8/26		Mechanical Kill 9/9		Sinox Gen. 8/26		Sinox Gen. 9/9		Check		Means	
	Yield	Disc.	Yield	Disc.	Yield	Disc.	Yield	Disc.	Yield	Disc.	Yield	Disc.	Yield	Disc.	Yield	Disc.
Cobbler (check)	43.5	13.5	38.8	19.5	36.2	18.2	35.9	19.5	38.4	18.5	37.6	13.7	38.4	14.8		
Kennebec	38.5	7.2	28.1	15.5	35.5	11.0	25.4	10.0	32.8	10.5	43.0	8.2	33.8	10.4		
Yampa	24.1	7.2	17.4	11.7	30.4	10.5	16.2	10.0	30.5	12.0	28.4	6.7	24.5	8.5		
Sebago	48.4	10.0	21.5	19.2	35.0	15.5	28.5	16.2	33.6	15.5	44.0	8.0	35.2	14.1		
	38.6	9.5	26.5	16.5	34.3	13.8	26.5	14.4	33.8	14.1	38.3	9.2	34.2	11.9		

Least Significant Differences

	Discoloration		Yields	
	P - .05	P - .01	P - .05	P - .01
Between Treatment Means all 4 Varieties included	1.1	1.6	5.1	7.1
Between Variety Means all 6 treatments included	1.0	1.2	3.9	5.3
Between Treatment Means in same variety	2.2	2.9	9.5	12.8

1/Plots are 25 hills grown in randomized blocks with 4 replications.

2/Figures are number of tubers discolored in 30 tuber random sample; means of 4 plots in randomized block.

Kansas

Claude L. King

In 1949 Kennebec and five numbered blight-resistant varieties, B 61-3, B 75-4, B 351-44, B 69-16 and X 96-56, were grown in the Kaw Valley. The most outstanding variety was B 69-16 which outyielded the standard varieties Irish Cobbler and Red Warba by about 50 bushels per acre, and the tubers were much smoother. The tuber quality of B 69-16 was excellent.

Kansas table 1 gives the yield data and other notes on these varieties.

Variety	Yield of U. S. No. 1 tubers per acre	Remarks by County Agent
	Bu.	
Kennebec	244	Quality good. Second growth. Sand scurf.
B 61-3	232	Some scab.
B 75-4	127	Sand scurf. Eighty-nine large rotted tubers.
B 351-44	125	Many exposed green tubers, few rots. Lots of scab. Quality good +.
B 69-16	333	Excellent quality, 6 rots.
B 96-56	54	Small irregular, second growth, poor quality, sand scurf.

MAINE

Leafroll Resistant Seedlings

G. W. Simpson and R. Bonde

Testing for leafroll resistance at Presque Isle was continued as usual. In 1949 5,780 new seedlings were added to the test. Survivors from the introductions of the 3 previous years were retested. The results are shown in Maine tables 1, 2, 3, and 4. Although the seedlings surviving the first year have never been numerous, among the seedlings introduced in 1949 the percentage of survival was greater than that in previous years. This is believed to be due to the greater use of resistant parents, previously selected in these and other tests as having some resistance to leafroll. This result is decidedly encouraging.

Much of the material now becoming available has other satisfactory characters as well, and it is expected that a few selections can be increased for yield tests and for other uses.

Maine table 1. Reactions of progenies of different crosses and selfed lines to leafroll infection, resulting from artificial inoculations with viruliferous aphids in each of 4 successive seasons.

Pedigree	Parentage	Seedlings planted 1946	Replanted 1949	Replanted 1948	Replanted 1947	Surviving 4th inoculation & saved for possible use as parents	
		No.	No.	No.	No.	No.	Pct.
B 732	Teton x X 247-24	83	0	0	1	0	0
B 733	Gr. Mt. x B 24-76	661	0	0	14	0	0
B 734	Gr. Mt. x X 247-44	523	1	2	9	0	0
B 748	White Rose x B 24-58	662	14	19	42	5	0.8
B 756	B 24-238 x 96-56	516	0	5	27	0	0
B 774	X 750-10 x Katahdin	127	0	1	3	0	0
B 775	X 792-32 x B 24-58	107	0	0	10	0	0
B 777	X 792-88 x Teton	412	0	0	1	0	0
B 784	X 1276-48 x B 24-58	271	19	24	65	10	3.7
B 785	X 1276-48 x X 247-44	452	10	14	43	2	0.4
B 787	X 1276-185 x Katahdin	146	1	1	8	0	0
B 790	X 1276-185 x X 247-44	262	2	4	20	1	0.4
B 796	Houma x Katahdin	399	1	3	32	0	0
B 798	X 247-42 x X 247-44	342	2	4	17	1	0.3
B 799	X 750-10 x 46952	329	4	24	79	0	0

Continued - Maine table 1. Reactions of progenies of different crosses and selfed lines to leafroll infection, resulting from artificial inoculations with viruliferous aphids in each of 4 successive seasons.

Pedigree	Parentage	Seedlings planted 1946	Replanted 1949	Replanted 1948	Replanted 1947	Surviving 4th inoculation & saved for possible use as parents	
		No.	No.	No.	No.	No.	Pct.
B 800	46952 x X 247-44	247	1	3	7	1	0.4
B 808	Triumf x Katahdin	170	0	0	12	0	0
B 809	Triumf x X 247-48	205	2	2	36	0	0
B 810	Houma x Shamrock	298	1	4	49	1	0.3
B 817	Houma x Triumf	611	9	23	115	5	0.8
B 819	Houma x X 247-48	600	4	5	60	1	0.2
B 820	Houma x 336-144	402	0	0	8	0	0
B 1135	X 247-24 selfed	289	0	1	2	0	0
B 1136	X 247-42 selfed	372	3	8	21	2	0.5
B 1137	X 247-48 selfed	264	0	0	1	0	0
B 1138	Katahdin selfed	226	0	0	0	0	0
	Total	8976	74	147	682	29	

Maine table 2. Reaction of progenies of different crosses and selfed lines to leafroll infection resulting from artificial inoculations with viruliferous aphids in each of 3 successive seasons.

Pedigree	Parentage	Seedlings planted in 1947	Replanted 1949	Replanted 1948	Saved for retesting	
		No.	No.	No.	No.	Pct.
B 851	X 1276-185 x X 96-56	206	3	16	0	0
B 852	X 1276-185 x X 157-9	280	14	38	4	1.4
B 853	X 1276-185 x B 355-24	135	0	2	0	0
B 854	X 1276-185 x X 792-94	176	7	34	1	0.6
B 855	X 1276-185 x B 294-38	135	4	26	2	1.5
B 856	X 1276-185 x B 66-1	137	1	9	1	0.7
B 857	X 1276-185 x B 81-40	155	5	21	0	0
B 858	X 1276-185 x Katahdin	38	1	1	0	0
B 859	X 1276-185 x Teton	129	8	25	5	3.9
B 860	Triumf x B 294-38	63	4	7	2	3.2
B 861	Dakota Red x X 247-44	356	9	46	4	1.1
B 862	Earlaine x X 247-48	93	3	10	1	1.1
B 863	Gr. Mt. x Triumf	112	3	11	1	0.9
B 864	Houma x X 247-48	393	34	81	10	2.5
B 865	Katahdin x Triumf	469	1	23	0	0

Contin. Maine table 2. Reaction of progenies of different crosses and selfed lines to leafroll infection resulting from artificial inoculations with viruliferous aphids in each of 3 successive seasons.

Pedigree	Parentage	Seedlings planted in 1947	Replanted 1949	Replanted 1948	Saved for Retesting	
		No.	No.	No.	No.	Pct.
B 866	Katahdin x X 247-48	491	3	23	1	0.2
B 867	Mohawk x X 247-48	244	4	9	2	0.8
B 868	B 24-78 x X 247-24	415	61	88	34	8.2
B 869	Sebago x X 247-42	241	1	8	1	0.4
B 870	Sebago x X 247-48	34	0	0	0	0
B 871	Shamrock x X 247-48	76	0	5	0	0
B 872	B 24-76 x B 24-238	479	57	80	29	6.1
B 873	X 247-44 x Teton	529	5	24	1	0.2
B 874	X 247-44 x B 61-3	296	0	6	0	0
B 875	X 247-48 x Triumf	104	4	5	2	1.9
B 876	X 1276-179 x X 247-48	681	44	76	16	2.3
B 877	X 1276-185 x Katahdin	220	9	21	2	0.9
B 878	X 1276-185 x 96-56	410	24	83	4	1.0
B 934	O 55 x B 294-38	108	0	2	0	0
B 941	B 294-38 x Katahdin	330	2	13	0	0
B 942	B 294-22 x B 294-38	242	6	34	0	0
B 943	B 294-22 x X 96-56	30	0	4	0	0
B 954	Houma x X 792-94	32	4	7	0	0
B 955	Houma x Katahdin	11	0	6	0	0
B 986	Houma x X 792-94	63	2	11	1	1.6
B 987	Katahdin x X 792-94	90	0	9	0	0
B 1164	B 294-38 selfed	310	7	19	0	0
	Total	8313	330	883	124	

Maine table 3. Reaction of progenies of different crosses and selfed lines to leafroll infection resulting from artificial inoculations with viruliferous aphids in 1948 and reinoculation in 1949.

Pedigree	Parentage	Seedlings planted in 1948	Replanted 1949		Surviving 2nd inoculation in 1949 and saved	
		No.	No.	Pct.	No.	Pct.
B 2068	Chippewa x B 522-33	388	21	5.4	3	0.8
B 2071	Chippewa x X 792-94	289	10	3.5	1	0.4
B 2081	Gr. Mt. x X 247-48	264	18	6.8	9	3.4
B 2082	Gr. Mt. x B 522-33	189	23	12.2	2	1.1
B 2089	Houma x Katahdin	61	4	6.6	0	0

Contin. Maine table 3. Reaction of progenies of different crosses and selfe lines to leafroll infection resulting from artificial inoculations with viruliferous aphids in 1948 and reinoculation in 1949.

Pedigree	Parentage	Seedlings planted in 1948	Replanted 1949		Surviving 2nd inoculation in 1949 and saved	
		No.	No.	Pct.	No.	Pct.
B 2090	Houma x B 445-41	137	6	4.4	0	0
B 2091	Houma x B 522-33	211	39	18.5	7	3.3
B 2095	Katahdin x B 522-33	207	11	5.3	0	0
B 2096	Katahdin x B 445-41	239	0	0	0	0
B 2097	Mohawk x Erie	335	1	0.3	0	0
B 2110	Ostbote x B 522-33	116	7	6.0	0	0
B 2112	Ostbote x X 792-94	305	33	10.8	3	1.0
B 2113	Placid x B 522-33	262	17	6.5	4	1.5
B 2120	Sebago x B 522-33	177	5	2.8	0	0
B 2121	Skerry Champion x B522-33	298	8	2.7	0	0
B 2122	Starkeragis x B 522-33	190	0	0	0	0
B 2123	Teton x B 355-44	731	5	0.7	0	0
B 2125	Triumf x B 522-33	69	2	2.9	0	0
B 2128	Virgil x B 522-33	345	25	7.2	10	2.9
B 2144	X 96-56 x B 522-33	163	2	1.2	0	0
B 2146	X 157-9 x B 522-33	334	7	2.1	0	0
B 2147	X 245-186 x B 522-33	275	2	0.7	0	0
B 2149	X 247-48 x Triumf	79	10	12.7	1	1.3
B 2150	X 247-48 x B 522-33	349	18	5.2	6	1.7
B 2151	B 294-38 x B 522-33	255	11	4.3	1	0.4
B 2163	B 401-3 x Triumf	175	2	1.1	0	0
B 2166	B 446-54 x Triumf	162	3	1.9	1	0.6
B 2168	B 446-54 x B 522-33	184	2	1.1	0	0
B 2169	B 522-33 x X 792-94	54	1	1.9	0	0
B 2170	X 528-170 x B 522-33	170	4	2.4	0	0
B 2171	B 594-46 x Triumf	22	2	9.1	0	0
B 2174	X 750-10 x Triumf	38	16	42.1	0	0
B 2175	X 750-10 x B 445-41	156	3	1.9	0	0
B 2176	X 750-10 x B 522-33	171	8	4.7	0	0
B 2179	X 792-88 x B 522-33	176	3	1.7	0	0
B 2184	X 1276-185 x B 522-33	56	3	5.4	0	0
B 2185	X 1276-185 x B 401-3	210	3	1.4	1	0.5
B 2186	X 1276-185 x B 445-41	84	1	1.2	0	0
B 2187	X 1276-185 x B 522-33	86	5	5.8	0	0
B 2189	41956 x B 522-33	433	18	4.2	3	0.7
B 1189	X 247-48 selfed	72	16	22.2	8	11.1
B 1190	B 294-38 selfed	228	18	5.3	2	0.9
B 1201	X 792-94 selfed	92	19	20.1	0	0
	Total	8837	412	4.7	62	

Maine table 4. Reaction of progenies of different crosses and selfed lines to leafroll infection resulting from artificial inoculation with viruliferous aphids in 1949.

Pedigree	Parentage	Seedlings planted in 1949	Saved for retesting in 1950	Surviving the first year's test
		No.	No.	Pct.
B 2351	Houma x B 582-33	82	9	11.0
B 2352	WSC 17 x B 582-33	82	9	11.0
B 2353	WSC 17 x B 1122-25	105	26	24.8
B 2354	B 24-78 x B 582-33	80	17	21.3
B 2355	B 522-33 x Triumf	86	7	8.1
B 2356	B 582-33 x B 607-56	146	7	4.8
B 2357	B 582-66 x B 584-11	156	68	43.6
B 2358	B 859-14 x B 582-33	109	0	0
B 2359	B 1122-25 x B 24-78	331	101	30.5
B 2360	B 1122-25 x B 584-11	168	29	17.3
B 2361	B 1122-25 x 1241-90	77	2	2.6
B 2362	B 1122-25 x 1276-185	48	10	20.8
B 2363	B 1122-25 x B 607-56	329	6	1.8
B 2364	1276-185 x B 1122-25	55	11	20.0
B 2365	1276-185 x B 445-41	523	17	3.3
B 2366	1276-185 x B 582-33	50	14	28.0
B 2367	B 859-19 x B 582-33	52	5	9.6
B 2374	B 582-33 x B 522-33	250	28	11.2
B 2375	B 582-33 x B 1122-25	119	7	5.9
B 2376	B 582-33 x 1241-90	46	0	0
B 2377	B 582-33 x 1241-91	126	1	0.8
B 2378	B 583-66 x B 582-33	144	31	21.5
B 2379	B 583-66 x 1241-91	51	9	17.6
B 2380	B 673-76 x B 582-33	216	16	7.4
B 2381	B 673-76 x B 1122-25	162	14	8.6
B 2382	B 673-76 x 1276-185	155	24	15.5
B 2384	B 778-15 x B 582-33	166	10	6.0
B 2385	B 779-1 x B 582-33	109	8	7.3
B 2419	B 478-1 x 96-44	171	3	1.8
B 2420	B 478-1 x 157-9	354	30	8.5
B 2422	B 478-1 x B 446-58	131	3	2.3
B 2423	B 478-1 x B 582-33	313	33	10.5
B 2449	Houma x Netted Gem Mutant	381	100	26.2
B 2575	B 446-54 x B 247-48	148	11	7.4
B 1220	WSC 23 selfed	109	0	0
B 1221	B 24-78 selfed	150	35	23.3
	Total	5780	701	12.1

MAINE

Resistance to Feeding Injury by Green Peach Aphids

G. W. Simpson and D. F. Akeley

For several years various varieties and seedlings have been grown in cages and uniformly infested when about 15 inches high with a definite number of wingless adults of the green peach aphid. When conditions are favorable for aphid increase, it is possible in 6 weeks following infestation to determine rather accurately how a particular variety is affected by the aphids and also its effect upon the aphid as measured by the increase in population and the production of winged forms.

In 1949, several progenies, especially developed for this study, became available. The results of the test are given in Maine tables 5 and 6.

Maine table 5. Reaction of certain progenies to infestation with green peach aphid, M. persicae (Sulz.)

Pedigree	Parentage	Seedlings tested	Seedlings classed as		
			Not easily injured	Tolerant	Easily injured
		No.	No.	No.	No.
B 935	X 96-56 x B 294-38	12	4	3	5
B 936	X 792-94 x B 294-38	11	1	2	8
B 938	B 30-143 x B 294-38	15	1	2	12
B 939	41956 x B 294-38	18	0	1	17
B 940	B 294-38 x B 355-24	6	0	0	6
B 944	B 294-22 x X 792-94	19	4	5	10
B 2072	Empire x B 61-3	27	0	6	21
B 2073	Empire x X 157-9	14	0	0	14
	Empire	1			X
	Kennebec	1		X	
	41956	1			X
	792-94	1			X
	X 96-56	1		X	
	X 157-9	1			X
	B 294-22	1	X		
	B 294-38	1		X	
	B 61-3	1			X
		131			

The inclusion of the parents used in making the crosses was intended to provide additional information. The few seedlings falling into the category "not easily injured" had at least one parent that was not easily injured by the feeding of green peach aphids.

Maine table 6 is of interest in connection with the spread of leafroll since winged green peach aphids are the important vectors of this disease. There is a wide range in the production of winged forms. It would be highly desirable to grow varieties that do not produce winged aphids quickly and abundantly, other factors being equal.

Maine table 6. The production of winged forms of the green peach aphid following the infestation of 131 varieties of potatoes.

Pedigree	Parentage	Seedlings producing winged green peach aphids			
		Seedlings tested	Quickly and abundantly	Eventually in small numbers	Not found
		No.	No.	No.	No.
B 935	X 96-56 x B 294-38	12	1	8	3
B 936	X 792-94 x B 294-38	11	2	9	0
B 938	B 30-143 x B 294-38	15	12	3	0
B 939	41956 x B 294-38	18	12	6	0
B 940	B 294-38 x B 355-24	6	3	3	0
B 944	B 294-22 x X 792-94	19	10	8	1
B 2072	Empire x B 61-3	27	21	6	0
B 2073	Empire x X 157-9	14	14	0	0
	Empire	1	X		
	Kennebec	1	X		
	41956	1	X		
	792-94	1	X		
	X 96-56	1	X		
	X 157-9	1	X		
	B 294-22	1		X	
	B 294-38	1	X		
	B 61-3	1	X		

MAINE

Reiner Bonde

Resistance to Ring Rot -- 1949

Approximately 291 selected seedlings from different progenies were tested in 1949 for ring rot resistance. The results of this test are summarized in Bonde table 1.

Bonde table 1. Ring rot resistant seedlings in different progenies inoculated in the field in 1949.

Ring rot in controls included for comparison[1]

Variety or cross	U.S.D.A. pedigree	Seedlings tested	Resistant seedlings or lots[2]		Seedlings saved for further use[3]
			No.	Pct.	No.
Katahdin controls	(60 lots, 300 plants)		0[4]	0	0[4]
Erie x B 61-3	B 2076	11	1	9	1
Erie x (X157-9)	B 2077	6	3	50	2
Erie x B 445-41	B 2078	28	5	18	3
Hindenburg x Erie	B 2083	10	1	10	1
Mohawk x B 355-24	B 2098	54	12	22	7
Ostbote x Teton	B 2105	66	10	15	10
Ostbote x B 355-44	B 2108	37	8	22	7

(continued)

Contin. Bonde table 1.

Variety or cross	U.S.D.A. pedigree	Seedlings tested	Resistant seedlings or lots 2/		Seedlings saved for further use 3/
			No.	Pct.	No.
Sebago x B 355-44	B 2116	16	6	38	3
Sebago x B 355-44	B 2117	10	4	40	4
B 76-43 x B 445-41	B 2142	25	3	12	2
Earlaine selfed	B 1173	28	7	25	3

1/ Five freshly cut seed pieces of each seedling were inoculated by being dipped in a heavy suspension of the bacteria and planted immediately in the field.

2/ Showed no ring rot in foliage or in tubers at time of harvest.

3/ Seedlings saved for further use because of desirable tuber type and plant characteristics, combined with ring rot resistance.

4/ Of 300 control plants inoculated, 290 developed ring rot symptoms or 96.6 percent.

Relatively few of the selected seedlings survived the severe inoculations to which they were subjected. However, many of the seedlings that did survive the test were early maturing and possess desirable plant characteristics and marketing qualities. This is a distinct advance over the results of earlier work when most of the resistant seedlings were very late and possessed poor marketing qualities.

The reaction of 9 named varieties and 6 seedlings used as parents for the above reported experiments are given in Bonde table 2. The varieties

Bonde table 2. Ring rot in parents of seedlings of different progenies inoculated in the field in 1949.

Variety or seedling	Inoculated	Without ring rot 1/	
	No.	No.	Pct.
Katahdin controls	20	0	0
Mohawk	5	0	0
Sebago	5	2	40
Teton	5	5	100
Earlaine	5	3	60
Eric	5	5	100
X 792-94 or X 792-94	5	1	20
Hindenburg	5	1	20
Ostbote	5	1	20
X 157-9	5	4	80
B 61-3	5	1	20
B 76-43	5	1	20
B 355-24	5	5	100
B 355-44	5	5	100
Ontario	5	0	0
Kennebec	5	1	20

1/ Inoculated by dipping freshly cut seed pieces in heavy suspension of the ring rot bacteria. Seed pieces planted immediately after inoculation.

Teton, B 355-24, and B 355-44 continued to show no ring rot infection as a result of the inoculations. Seedling A 157-9 apparently is less resistant, and one infected plant developed. Of interest is the fact that Sebago and Earlaine appear to possess some resistance to the disease. The varieties Mohawk, Hindenburg, Catbote Ontario, and Kennebec and seedlings A 792-94, B 61-3, and B 76-43 were highly susceptible.

Approximately 2,145 unselected seedlings from progenies of 12 crosses were inoculated with ring rot bacteria to learn more about the inheritance of resistance to this disease. The results of this experiment are summarized in Bonde table 3. Teton, Eric, and B 355-24 continued to be

Bonde table 3. Percentage ring-rot resistant seedlings in progenies from crosses using parents with different degrees of susceptibility. Aroostook Farm - 1949

Parentage	Pedigree No.	Degree resistance in parents used in crosses	Seedlings inoculated 1/			Infected in inoculated controls
			Total	Infected		
			No.	No.	Pct.	No.
Eric selfed	B 1213	Medium selfed	62	2	3.2	100
Teton selfed	B 1219	High selfed	201	26	12.9	100
Furore x B 446-58	B 2386	High x high	114	56	49.1	98
Friso x B 607-56	B 2388	High x high	195	24	12.3	97
Teton x B 446-58	B 2389	High x high	235	133	56.5	91
B 607-56 x B446-58	B 2393	High x high	157	50	31.8	93
B 607-72 x B355-24	B 2394	High x high	370	23	6.2	99
B 607-56 x B607-72	B 2397	High x high	190	10	5.2	98
96-56 x B 445-41	B 2400	Susceptible x high	275	100	36.3	99
Chippewa x B355-24	B 2430	Sus. x high	131	50	38.2	100
B 446-54 x Teton	B 2572	High x high	96	6	6.3	99
B 446-54 x 96-56	B 2573	High x sus.	119	37	31.1	96

1/ Inoculated by dipping bruised and cut tubers in heavy suspension of the ring-rot bacteria. Tubers planted immediately after inoculation.

good parents and produced high percentages of resistant seedlings when used in making the crosses.

The foreign varieties Furore and Friso also produced resistant seedlings when used as parents. Of interest is the fact that Eric, which is medium resistant to ring rot, produced a progeny with a high percentage of resistant seedlings when selfed.

Many of the seedlings possessed resistance to both ring rot and late blight when seedling B 355-24 was used as a parent.

Bonde table 4. Reaction to ring rot infection of Katahdin controls of parents of crosses and their progenies. Aroostook Farm - 1949

Variety or cross	U.S.D.A. pedigree	Check & parent lots tested[1]	Seedlings tested[1]	Classes of infection[2]						Total showing infection
				0	1	2	3	4	5	
		No.	No.	%	%	%	%	%	%	%
Katahdin controls		50		0	0	2	4	10	84	100
Mohawk		1		0	0	0	0	0	100	100
Sebago		1		40	0	0	60	0	0	60
Teton		1		100	0	0	0	0	0	0
Earlaine		1		0	0	60	0	0	0	40
Erie		1		100	0	0	0	0	0	0
X 792-94		1		20	0	0	0	80	0	80
Hindenburg		1		20	0	0	0	80	0	80
Ostbote		1		20	0	0	0	80	0	80
X 157-9		1		0	20	0	0	0	0	20
B 61-3		1		20	0	0	0	80	0	80
B 76-43		1		0	20	0	0	0	0	20
B 355-24		1		100	0	0	0	0	0	0
B 355-44		1		100	0	0	0	0	0	0
Ontario		1		0	0	0	0	0	100	100
Kennebec		1		20	0	0	0	80	0	80
Erie x B 61-3	B 2076		11	9	9	0	0	0	82	91
Erie x (X 157-9)	B 2077		6	50	0	0	17	0	33	50
Erie x B 445-41	B 2078		28	18	53	14	4	0	11	82
Hindenburg x Erie	B 2083		10	10	10	20	30	10	20	90
Mohawk x B 355-24	B 2098		54	22	15	11	13	9	30	78
Ostbote x Teton	B 2105		66	15	14	12	17	6	36	85
Ostbote x B355-24	B 2108		37	22	14	5	11	8	41	78
Sebago x B 355-44	B 2116		26	38	23	8	8	4	19	62
B 76-43 x B445-41	B 2142		25	12	4	0	0	4	80	88
Earlaine selfed	B 1173		28	14	21	4	11	7	43	86

1/ Five freshly cut seed pieces of each variety or lot inoculated by being dipped in a heavy suspension of the bacteria and planted immediately in the field.

2/ Class of infection — Plants infected

0	None
1	1
2	2
3	3
4	4
5	5

Ring-rot resistant desirable seedlings saved from 1949 field-inoculation test Plot 1/

Stake No. 1949	Pedigree No.	Parentage	Comments
2	B2076-2	Eric x B 61-3	Fair, flowers
23	B2078-5	Eric x B 445-41	Fair, flowers
29	-11	"	Poor, early
36	-18	"	Fair, early
37	-19	"	Early, good
52	B2083-6	Hindenburg x Eric	Fair
71	B2098-15	Mohawk x B 355-24	Fair
86	-30	"	Early, fair
87	-31	"	Early, fair
90	-34	"	Good
95	-39	"	Fair
97	-41	"	Good
106	-50	"	Fair
114	B2105-4	Ostbote x Teton	Fair
125	-15	"	Fair
131	-21	"	Good*
139	-29	"	Good*
156	-46	"	Fair, late
173	-63	"	Good
174	-64	"	Fair
191	B2108-14	Ostbote x B355-44	Good
192	-15	"	Fair
197	-20	"	Fair
204	-27	"	Fair, small
208	-31	"	Fair, small
213	-36	"	Fair
214	-37	"	Fair
216	B2116-2	Sebago x B 355-44	Good*
218	-4	"	Good
227	-13	"	Good*
232	B2117-2	Sebago x B 355-44	Good
233	-3	"	Fair
234	-4	"	Good
238	-8	"	Good
250	B2142-10	B76-43 x B 445-41	Fair
255	-15	"	Fair
267	B2182-1	X792-94 x B355-44	Good, Note also resistant to leaf roll
269	B1173-2	Earlaine selfed	Fair, flowers
275	-8	"	Fair
287	-20	"	Good, small

1/ Seedlings selected because of resistance to ring rot and also possessing desirable plant and tuber characteristics.

*Appear to be especially good.

MAINE

Donald Folsom

Leaf roll Resistance, 1949

After deciding a year ago that the field test on Highmoor Farm with every third row leaf-roll Chippewas, was less severe than the aphid-transmission test at Aroostook Farm, it was found this summer that the field test in 1948 was somewhat more severe than the aphid test, as well as more severe than any field test of previous years. Seedling B 24-58, which had not contracted leaf roll in many years of testing on Highmoor Farm, contracted about 40%. About 25% of the seedlings received in 1947 and 1948, after passing the aphid test, contracted leaf roll in 1948.

Of the many seedlings introduced to the Highmoor Farm field test from 1938 to 1945, inclusive, seedling 1276-185 was grown on 50 to 100 acres in central Maine this summer as a replacement for Chippewa, more for other characteristics than for its resistance to leaf roll. Seedling X 750-10 was in commercial demand in 1948 for its cooking quality. Two seedlings with 750-10 and B 24-58 in the parentage are being increased at Highmoor Farm and in 1950 on Aroostook Farm will be in more extensive yield tests than have been made to date. These two appear field-resistant to virus X.

Several resistant seedlings introduced to the Highmoor Farm test in 1946 from Beltsville are being increased and will be tested for yield, leaf roll transmission by aphids, X virus, cooking quality, mahogany browning, and resistance to late blight, ring rot, and scab. Some have parents that are resistant to scab or to scab and late blight.

Several seedlings introduced to Highmoor Farm from the Aroostook Farm aphid test in 1947 are mostly resistant to X, and are being increased and used for various tests. One has Sebago as a parent.

Several resistant seedlings introduced to Highmoor Farm from Beltsville in 1947 have Teton as a parent or B 355-24, which is resistant to late blight and ring rot. These are being increased and used for various tests.

Twelve seedlings introduced to Highmoor Farm from the Aroostook Farm aphid test in 1948 and 13 seedlings from the test in 1949 are being increased for various tests. These 25 seedlings, except one, have one or both parents (mostly both) of a variety or seedling that is resistant to leaf roll in the field.

Ninety-six seedlings introduced to Highmoor Farm from Beltsville in 1948 passed the 1948 field test for leaf roll resistance, vine type, and tuber type, and are being increased. Nearly every one has a parent resistant to late blight and ring rot, or to late blight, ring rot, and scab.

No seedlings were introduced from Beltsville in 1949, when the peak of the aphid infestation index did not reach 100 per 50 leaves, whereas it has reached 800 to 3,000 in previous years. The available space at Highmoor Farm had best be used from now on for increasing the seedlings now on hand and also those seedlings to be available from the Aroostook Farm aphid transmission test. At Aroostook Farm there is constant contamination and elimination of seedlings by spindle tuber and rugose mosaic, which apparently can be controlled at Highmoor Farm.

It is not considered proved that the use of DDT and other control measures has eliminated the leaf roll problem in Maine. The low point in aphid infestation of 1949 on Highmoor Farm was reached without any use of DDT, and an increase in aphid infestation occurred in Aroostook County in 1949 in spite of the use of DDT.

MAINE

W. C. Libby and Robert V. Akeley

The cooperative yield tests were conducted again in 1949 by the Maine Agricultural Experiment Station and the Bureau of Plant Industry, U.S.D.A. The objectives of these trials were, as usual, to test the older standard varieties and more promising seedling varieties for horticultural characters, such as yielding ability or adaptation, dry-matter content, as indicated by specific gravity, tuber type, vine growth, maturity, and also to observe their resistance or susceptibility to the potato diseases in Maine.

These tests were carried on at the following six locations: Van Buren, Presque Isle, Houlton, Lee, Exter, and Unity. Each plot in each location was fertilized, cultivated, and sprayed in the same manner as that for other potatoes on the grower's farm. Observations were made during the growing season. Yield and specific gravity data were made at harvest-time.

Maine (Libby) table 1 presents the 20 varieties and the data on yield and specific gravity for the 6 locations in 1949. The 2 remarkable features this season were the higher than normal yields and the lower specific gravity readings for all locations except at Unity, which had low yields due probably to very dry growing conditions.

Van Buren led the other locations with an average yield of 703 bushels per acre for all varieties, and Houlton was second with 648. The specific gravity readings on the same basis show Presque Isle first at 1.071 and Lee second at 1.068.

Ontario (scab res.) again topped all other varieties and seedlings for an average yield for the six locations of 748 bushels per acre, and the Essex (blight res.) was second at 744.3 bushels. The Pontiac (red tubers), Kennebec (blight res.), Green Mountain, B 76-43 (blight res.), Teton and Erie (ring rot res.), and B 355-35 (blight and ring rot res.) were all above the 600-bushel average yield per acre. The single highest yield, 880 bushels per acre, was the Essex, grown at Van Buren, and the lowest, 218 bushels per acre, was the Pawnee, grown at Unity.

The specific gravity was low for both locations and varieties this season. The Green Mountain and Mohawk were the highest, with 1.070 readings. B 76-43 and B 313-81 at 1.069,and B 61-3 at 1.068, were nearly as good. The Essex at 1.057 and Pontiac at 1.055 were the two lowest.

The reactions of four of the seedlings are interesting, because progress is shown in obtaining several resistant combinations. Seedling B 294-22 has resistance to aphid injury, B 61-3 to late blight and scab combined, B 355-35 to late blight and ring rot combined, and B 73-10 to late blight resistance and early maturity.

Maine (Libby) table 1. Cooperative yield trials, Maine 1949. Comparison of yields of 20 potato varieties grown at 6 locations in Maine 1/

Variety	Van Buren		Presque Isle		Houlton		Lee		Exeter		Unity 2/		Ave. yield per 6 locations	Specific gravity
	Yield per acre	Specific gravity	Yield per acre	Specific gravity	Yield per acre	Specific gravity	Yield per acre	Specific gravity	Yield per acre	Specific gravity	Yield per acre	Specific gravity		
	Bu.		Bu.		Bu.		Bu.		Bu.		Bu.		Bu.	
Ontario	839	1.056	701	1.065	776	1.060	753	1.065	805	1.058	616	1.060	748	1.061
Essex	880	1.054	774	1.063	790	1.058	713	1.063	816	1.054	492	1.052	744	1.057
Pontiac	759	1.053	749	1.062	820	1.054	640	1.060	671	1.050	501	1.051	690	1.055
Kennebec	743	1.059	759	1.070	702	1.057	652	1.068	655	1.062	571	1.062	680	1.063
B76-43	811	1.063	653	1.076	696	1.067	667	1.074	722	1.067	422	1.067	662	1.069
Green Mt.	653	1.066	674	1.076	680	1.069	648	1.076	655	1.068	571	1.065	647	1.070
Teton	739	1.062	646	1.070	642	1.058	538	1.064	633	1.058	517	1.056	619	1.061
B355-35	643	1.064	657	1.072	619	1.063	586	1.067	646	1.064	561	1.062	619	1.065
Erie	622	1.059	686	1.067	574	1.060	534	1.065	612	1.062	580	1.056	601	1.062
B73-10	767	1.059	665	1.069	639	1.060	543	1.070	542	1.068	437	1.058	599	1.064
Menominee	622	1.060	591	1.068	532	1.062	628	1.066	578	1.065	549	1.059	583	1.063
Chippewa	717	1.056	646	1.063	711	1.062	541	1.063	452	1.062	390	1.054	576	1.060
Katahdin	617	1.060	617	1.066	677	1.061	526	1.067	509	1.060	497	1.059	574	1.062
Mohawk	573	1.065	586	1.072	611	1.066	549	1.079	553	1.068	519	1.072	565	1.070
B61-3	651	1.061	582	1.076	638	1.068	550	1.072	534	1.068	427	1.064	564	1.068
B294-22	783	1.064	563	1.074	642	1.067	470	1.067	529	1.064	385	1.064	562	1.067
B313-31	674	1.059	563	1.072	600	1.065	485	1.064	454	1.062	281	1.058	510	1.063
B313-81	677	1.064	524	1.080	567	1.066	429	1.073	403	1.072	275	1.061	479	1.069
X96-56	699	1.062	488	1.078	539	1.065	417	1.068	444	1.065	228	1.057	469	1.066
Pawnee	591	1.065	529	1.074	506	1.072	431	1.065	366	1.063	218	1.060	440	1.067
Ave. of 20 varieties	703	1.061	633	1.071	648	1.063	565	1.068	579	1.063	452	1.060		
L.S.D. 5%	93		58		132		65		107		53			
L.S.D. 1%	124		77		175		86		142		70			

1/ All varieties planted 9 inches apart in the row with 34 inches between rows. Six replications with 30 hills per individual plot.

2/ Unusually dry conditions prevailed during the summer at Unity, Maine.

MARYLAND

R. A. Jehle

In Maryland during the year 1949, at higher elevations where only one potato crop is grown during the season, it was unusually cold and dry late in May and early in June with the results that stands were very poor in some fields. Later in the season weather conditions became very favorable for potato production and yields were large where stands were good.

In most of the remainder of the State conditions were not so favorable for potato production, especially for the late crop. The summer was unusually hot and dry, and rains were local. Parts of the Eastern Shore received favorable rains, and good yields were obtained but not as good as those obtained in 1948.

Late blight was very severe in the western part of the State, and only in the most thoroughly sprayed fields did the blight-susceptible varieties yield as well as those that were very resistant to blight. Late blight tuber rot was also severe in fields planted with susceptible varieties, which were not thoroughly sprayed. No late blight was observed or reported in the early crop in the remainder of the State, but some was present in the late crop.

The objectives of the potato work in Maryland continue to be the finding or producing of new potato varieties that are more resistant to diseases; have better appearance, table quality, and vigor; yield better; and respond better to treatment to break their dormancy than the old standard varieties; as well as producing or locating disease-free stocks of these new varieties in sufficient quantity to meet grower demands.

Eastern Shore -- Pilchard Farm, Pocomoke, Maryland.

Early Crop. On March 14 a potato field was planted with 14 varieties and 5 seedlings in 5 randomized replications, each containing 50 plants. Ten earlier maturing varieties and 6 earlier maturing seedlings were planted in one portion of the field and harvested July 18, and 4 later maturing varieties and 2 later maturing seedlings[1/] were planted in another part of the field and harvested July 29. The weather was very favorable for potato production until July 1, after which it became very hot and dry with little rainfall during the remainder of the season. The largest yields[2/] in the portion of the field harvested July 18 were obtained from Essex with 433 bushels of U. S. #1 potatoes per acre;[3/]

1/ Seedling B 164-15 was planted in both plots.

2/ All seed was grown in Garrett County, Maryland, unless otherwise stated.

3/ A difference of 60 bushels is significant at a 5% point.

seedling B 164-15 with 384 bushels; Marygold from home-grown seed with 370 bushels; Marygold with 367 bushels; seedling Md. 13-129 with 331 bushels; Pawnee with 333 bushels; seedling Md. 13-129 from home-grown seed with 331 bushels; and Irish Cobbler from home-grown seed with 322 bushels. All of these varieties and seedlings yielded significantly more than Irish Cobbler from Maine and North Dakota seed, both of which yielded 259 bushels per acre of U. S. #1 potatoes. Other varieties and seedlings that yielded significantly as well were Katahdin, B320-76, Teton, B 434-122, B 61-3, Houma, Chippewa and B 311-41. Only Cayuga yielded significantly less with 135 bushels per acre. Varieties harvested July 29 were grown on slightly higher ground and evidently suffered more from the drought. The largest yields in this portion of the field were obtained from White Pontiac with 369 bushels per acre of U. S. #1 potatoes; Kennebec with 321 bushels; Kennebec from home-grown seed with 301 bushels; Pontiac with 289 bushels; Sebago from home-grown seed with 272 bushels; and Sebago with 270 bushels. The lowest yields were obtained from seedlings 815-29 and B 164-15 from home-grown seed. The effect of the drought on this portion of the field was illustrated by the fact that the same seed of seedling B 164-15 grown in Garrett County was used in both parts of the field, yet in the portion harvested July 18 it yielded 384 bushels per acre of U. S. #1 potatoes and in the portion harvested July 29 it yielded only 258 bushels per acre.

Eastern Shore -- University Farm, Salisbury, Maryland.

This farm is located 35 miles north of the Pilchard farm on a lighter type of land. Eight varieties and four seedlings were planted with the same seed and in the same manner as they were on the Pilchard farm. The combination of less rain and lighter soil made conditions less favorable for potato production than they were on the Pilchard farm. Vines of the later maturing varieties and earlier maturing varieties were all dead when the field was harvested on July 12. The largest yields were obtained from Essex with 263 bushels per acre of U. S. #1 potatoes;1/ White Pontiac, 260 bushels; Kennebec home-grown seed, 243 bushels; Marygold, 238 bushels; seedling B 164-15, 238 bushels; and Kennebec, 227 bushels. The lowest yield was obtained from Irish Cobbler with 159 bushels per acre. Irish Cobbler was also outyielded by Sebago and Katahdin and seedlings Md. 13-129, B 311-41 and B 61-3.

During the years 1945 to 1949, inclusive, average yields from eight varieties included in all of the tests at Pocomoke were: Marygold 401 bushels of U. S. #1 potatoes per acre; Katahdin 387 bushels; Marygold from home-grown seed 374 bushels; Pontiac 364 bushels; Sebago 338 bushels; Irish Cobbler from home-grown seed 316 bushels; and Irish Cobbler from Maine seed 290 bushels.

Since support prices and keen competition with Virginia, North Carolina, and California have made the advantage of earliness questionable, and since all varieties with higher average yields during the past 5 years than Irish Cobbler are smoother and have as good or better table quality, Eastern Shore potato growers will probably find it profitable to sub-

1/ A difference of 37 bushels is significant at the 5% point.

stitute a large portion or all of their Irish Cobbler acreage with some of these varieties. Due to scarcity of Marygold seed stock and market preference for white tubers, Katahdin and Sebago will probably prove to be the best substitutes. Results from Essex, Kennebec and seedlings B 61-3 and B 164-15 have been so promising that small acreages are recommended for trial planting. Owing to its resistance to scab, seedling B 61-3 should be tested on scab infested soils.

Eastern Shore -- Late Crop

Potato test plots were planted on the University Farm at Salisbury and on the Pilchard farm at Pocomoke in five 25-plant randomized replications on July 21. Weather conditions were unfavorable for potato production. It was very hot during late July and early August and rainfall was scant and scattered. On the University Farm at Salisbury stands were so poor that no yield records could be obtained. On the Pilchard farm conditions were a little better and good stands were obtained from seed planted whole, but very poor stands were obtained from cut stored seed, and only fair stands from early home-grown seed treated to break its dormancy.

The largest yields were obtained with whole stored seed from Kennebec with 295 bushels per acre of U. S. #1 potatoes;1/ Pontiac, 228 bushels; Calrose, 220 bushels; seedling B 164-15 and Marygold both 217 bushels. Yields from cut stored seed varied from Calrose with 79 bushels per acre of U. S. #1 potatoes to only 8 bushels per acre from Sebago.

When early-grown seed treated to break its dormancy is used for planting the late crop, the plants are slower in coming up than when stored seed is used, and seed-piece decay and poor stands are common during seasons like those experienced in 1948 and 1949.

In 1949 tests were conducted with the chemicals thiram, nabam, and zineb in combination with chemicals used to break dormancy, but they all failed to increase either stands or yields.

Early-grown seed of Marygold, Irish Cobbler, Pawnee, Essex, and seedlings B 434-122, B 320-76, B 164-15 and B 61-3 were all planted in the late test plot. Three days after they were harvested the seed was cut and soaked 10 minutes in a 3/4% solution of ammonium thiocyanate and planted immediately. The yield from Marygold was 176 bushels per acre

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1/ A difference of 80 bushels is significant at the 5% point.

of U. S. #1 potatoes;1/ B 434-122, 87 bushels; Irish Cobbler, 77 bushels; B 320-76, 63 bushels; B 164-15, 55 bushels; B 61-3, 41 bushels; and Essex 29 bushels.

Results from work with the late potato crop on the Eastern Shore indicate that better stands can be expected from whole seed than from cut seed and that with early grown seed treated to break its dormancy poor stands and yields can be expected if the seed is planted in hot dry soil, but that best results can be obtained with the Marygold variety. Kennebec is the most promising variety but since sufficient seed is not yet available Sebago will be most desirable to plant in 1950. If a red variety is preferred, Pontiac should be used.

Garrett County

Weather conditions were unusually favorable for potato production, especially for early and mid-season varieties, and where stands were good, yields were usually above average.

All seed was planted in tuber units in 5 randomized replications each containing 20 tuber units.

Varieties harvested prior to September 15.

Six varieties and three seedlings were planted in a field sprayed with Bordeaux mixture, 4-4-50, eight times, four of the applications containing 1 pound of 50% wettable DDT; also with one very early application using 1 pound of 50% wettable DDT in 50 gallons of water. The largest yield was obtained from Essex with 700 bushels of U. S. #1 potatoes per acre;2/ Canus was next with 473 bushels; then came seedling B 434-122, 470 bushels; seedling B 61-3, 412 bushels; Marygold, 391 bushels; Katahdin, 380 bushels; Irish Cobbler, 358 bushels; Ashworth, 356 bushels; and B 320-76, 312 bushels.

Varieties harvested after September 15.

Eleven varieties and two seedlings were planted in a field sprayed with Bordeaux mixture, 4-4-50, 10 times, 5 of the applications containing 1 pound of 50% wettable DDT, also with one very early application using 1 pound of 50% wettable DDT in 50 gallons of water. Only 2 varieties, White Pontiac with a yield of 588 bushels of U. S. #1 potatoes per acre, and Potomac with a yield of 568 bushels, and seedling B 164-15 with a yield of 546 bushels yielded more than the old standard Smooth Rural (Mason) variety with a yield of 405 bushels.3/ Seedling B 69-16 and

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1/ A difference of 85 bushels is significant at the 5% point.

2/ A difference of 85 bushels is significant at the 5% point.

3/ A difference of 65 bushels is significant at the 5% point.

the varieties Sebago, Calrose, Pontiac, Ontario, Kennebec, Teton, Seneca, and Placid all yielded significantly as well.

In an adjacent field, which was sprayed only 3 times with 1 pound of 50% wettable DDT in 50 gallons of water, 12 varieties and 2 seedlings were planted. Late blight was very severe in this field in susceptible varieties both on the vines and in the tubers. Very little early blight was observed. Vines of Teton, Mason, and White Pontiac blighted severely and were killed by the middle of September. Vines of Sebago, Ontario, and seedling B 164-15 became severely blighted later in the season, and the vines were killed prematurely. The vines of Fillmore, Kennebec, Empire, Placid, Calrose, Sequoia, Seneca, and seedling B 69-16 were all very resistant to late blight, and little or none could be found. Many tubers of Sequoia and seedling B 164-15 were severely rotted with late blight and were left in the field. In this field nine varieties and one seedling yielded significantly more than the standard Smooth Rural (Mason) variety with 272 bushels of U. S. #1 potatoes per acre. They were Fillmore with 718 bushels of U. S. #1 potatoes per acre; seedling B 69-16 579 bushels; Kennebec, 554 bushels; Calrose, 473 bushels; Empire, 458 bushels; Placid, 450 bushels; Sebago, 423 bushels; White Pontiac, 410 bushels; Seneca, 393 bushels; and Ontario, 369 bushels. Sequoia with 276 bushels per acre of U. S. #1 potatoes; Teton, 242 bushels; and seedling B 164-15, 239 bushels yielded significantly as well.

In comparing these yields with those obtained in the adjacent field which received the customary spray schedule, it will be noted that Kennebec yielded 134 bushels per acre more; seedling B 69-15, 75 bushels more; Seneca, 54 bushels more; and Placid, 37 bushels more. All of these varieties showed a great deal of resistance to late blight. Kennebec was the only one that was included in a similar test in 1948 when both late and early blight were severe. The yield from Kennebec in the field that received the regular spray schedule was 190 bushels per acre more than that in the field which received only DDT. These results indicate that a modification of the spray schedule may be profitable with varieties which are very resistant to late blight, but further tests must be conducted before this can be definitely determined.

In the years 1945 to 1949, inclusive, seven of the same varieties were included in the test plots each year. Average yields obtained from these varieties were as follows: Potomac 437 bushels of U. S. #1 potatoes per acre; Sebago, 375 bushels; Pontiac, 359 bushels; Smooth Rural (Mason), 347 bushels; Marygold, 304 bushels; Katahdin, 264 bushels; and Irish Cobbler, 231 bushels.

These results and results from the 1949 tests indicate that among the late-maturing varieties Potomac and Sebago are the most profitable varieties to grow and that among the mid-season varieties Marygold and Katahdin are best. One grower found Marygold to be very profitable for the local market because it tuberized so early that he had marketable tubers to sell before anyone else, and they had better quality and sold more readily than those which were being shipped in. Of the newer late-maturing varieties Kennebec and seedling B 69-16 are promising for blight resistance, high yield, and good quality; Ontario and Seneca for scab and blight resistance; and seedling B 164-15 for its superior baking quality, high yields, and smoothness. Of the mid-season varieties, Essex is promising on account of its blight resistance and high yields; Canus, its excellent appearance and high yields; and seedlings B 434-122 and B 320-76, their good appearance and other desirable qualities.

MASSACHUSETTS

By Ralph W. Donaldson and Karol J. Kucinski

Twenty-three old and new varieties of potatoes were tested for yield by the Department of Agronomy, Massachusetts Agricultural Experiment Station. Mass. table 1 gives the yield data for these varieties.

Mass. table 1. Yield data on 23 potato varieties tested by the Department of Agronomy, Massachusetts Agricultural Experiment Station, Amherst, Mass., in 1949

Rank	Variety	Yield/acre Size A	Yield/Acre Size B	Yield/Acre less than 1½"	Total yield per acre over 1½"
		Bu.	Bu.	Bu.	Bu.
1	Katahdin	423	16	4	439
2	Essex	405	26	4	431
3	I. Cobbler	401	13	3	414
4	Triumph *	372	34	5	406
5	Katahdin *	389	9	3	398
6	Chippewa *	355	36	8	391
7	Pontiac *	366	20	5	386
8	Pontiac	351	18	4	369
9	Erie	331	32	12	363
10	Chippewa	329	28	7	357
11	I. Cobbler *	294	30	4	324
12	Ontario	272	40	11	312
13	Marygold	293	18	4	311
14	Early Ohio *	286	18	4	304
15	1276-185	263	34	7	297
16	Sebago	270	22	4	292
17	Teton	274	16	4	290
18	Kennebec	254	32	7	286
19	Houma	243	40	8	283
20	Sequoia	239	26	8	265
21	Warba *	218	34	6	252
22	Mohawk	222	18	4	240
23	Red Warba	212	20	4	232
24	Cayuga	191	36	7	227
25	Green Mountain	194	27	4	221
26	Pawnee	160	23	4	183
27	Norkota	136	36	9	172

* Quaker Hill Farm seed stock

The late varieties yielded relatively low. This was no doubt due to the drought conditions that prevailed in this section of New England. The extreme difference in yield between Katahdin and Green Mountain is worthy of note. Essex ranked second in yield, followed very closely by the Irish Cobbler grown from Maine seed.

MICHIGAN

J. H. Muncie and M. R. Hatfield

At the Lake City Experiment Station, 76 lots of second-year seedlings were planted on scabby soil, and from these 10 lots were selected for further tests in 1950. The scab-resistant parent was either Menominee or Hindenburg x Minn. 4-34-1-1. From the first-year seedlings, comprising 18 crosses, 31 were selected as sufficiently scab resistant for further tests. Six selections also were made from the third-year test of 30 seedling lots for scab resistance. Nine selections were made from the increase plots of 1946 seedling selections for over-State tests.

Eighty eight lots of seedlings from the Chapman Farm, Presque Isle, Maine, were received from the U.S.D.A. and eight from Nebraska. These were grown in six-hill blocks for increase. From these 43 were selected for further field trials in 1950. Certain of these seedlings are being used for hybridization in the greenhouse.

Stem-end rot and wilt caused by Fusarium eumartii continue to be a serious potato disease in several areas of Michigan. Further tests on resistance to this disease were made at the Lake City Experiment Station in 1949. Field plots previously infested in 1948 were reinfested for continuance of the tests. Planting was made in single 15-hill rows, randomized and replicated 4 times. The freshly cut tubers were planted in contact with the inoculum. The plots were watered by overhead irrigation throughout the season. All tubers from each plot were harvested, and each tuber was clipped at the stem end and examined for infection.

Thirteen named varieties and 34 seedlings, including 22 from the U.S.D.A., were included in these trials. Results of this test are given in Muncie table 1. Due to the heavy soil infestation there was a considerably higher percentage of tuber infection than in similar tests of the previous year. Under the severe conditions of these tests, seedlings Colo. 65-17, 1539, B 96-44, 527-1, 627-49, O-11, B 268-9, 2428-8 xx, 1844 and Teton, Chippewa, and Green Mountain varieties showed considerable resistance.

Muncie table 1. Reaction of potato seedlings to Fusarium eumartii infection - 1949.

Variety	Tuber infection	Variety	Tuber infection
	Pct.		Pct.
Bliss Triumph	60.6	U.S.D.A. B 268-9	43.9
Russet Sebago	71.5	Colo. 65-17	31.6
Menominee	69.2	1294-7 xx	93.1
Kennebec	78.9	2428-8 xx	45.9
Green Mountain	52.1	B 61-3	95.3
Teton	49.6	B 505-3	60.7
Pontiac	63.3	24-3	81.6
Irish Cobbler	64.4	O-11	42.8
Russet Rural	58.9	R 61-3	73.7
Sebago	75.4	627-49	40.9
Chippewa	48.1	B 96-44	37.1
Katahdin	59.8	1539	35.1
Erie	66.5	505-11	66.8
M 46-1	56.2	1844	53.1
M 46-2	58.5	5244	76.1
M 46-3	63.4	1425	65.2
M 42-13	93.6	529-1	59.2
M 42-6	68.2	527-1	37.7
M 42-22	66.7	1388	67.9
M 42-16	86.1	529-11	80.0
M 42-11	74.0	53-11	67.3
M 42-8	70.3	96-56	59.3
M 42-15	82.4		
M 42-2	65.9		

MICHIGAN

E. J. Wheeler and H. C. Moore

The Michigan program has been conducted along the same line as that for previous years with the addition of the study to determine the cause of an excessive amount of necrosis that is appearing in a number of the seedlings and named varieties. The work comprised the channeling of all new seedlings through a uniform test from crosses to the introduction stage. All tests are conducted in areas and on land where a disease or condition is most prevalent; namely, scab resistance is studied on a field where a clean crop is impossible with a susceptible variety, late blight studies are made where the disease is most likely to occur, tuber necrosis studies are made in a warmer section of the State on a light soil where this condition has occurred in the past, and cooking quality with special attention to color and texture of the tubers at most of the areas.

Scab Resistance

A number of older seedlings along with new selections, were grown on a scab-infested soil. The Chippewa variety was used as check to determine the amount and degree of scab infection on the lot of seedlings tested. Menominee, B 61-3, and Yampa were included in the test, along with the new introductions, to determine scab resistance and, more important, their worth as potential new varieties.

Severe deep scab infections with heavy amounts appeared rather uniformly on the Chippewa check over most of the test area. A severe test was given to the older seedlings, and many that had shown high resistance in a less favorable scab year were only mildly resistant in the 1949 test. Parent material showing high resistance to scab will be used in crosses for future breeding material.

LATE BLIGHT

Arthur Wolcott

Two hundred thirty seedlings, selected from 351 grown at the Upper Peninsula Experiment Station in 1948 were again tested in 1949. Notes were made on the number of seedlings containing net necrosis. With an exception of only a few, if they were netted at planting, the crop at harvest showed necrosis in the tubers. Late blight was prevalent in the area. A reading as to the degree of late blight infection was recorded. Many of the seedlings showed high resistance to late blight. Kennebec was included in the test, and no blight was observed on either the plants or any of the tubers. Scab readings were taken on the tubers, since it generally was present in all parts of the test area. Based on the tuber type, high yield, blight, and scab resistance 72 of the seedlings were earmarked for increase in 1950.

Net Necrosis

The 1949 growing season was favorable for the development of net necrosis. It appeared in the Irish Cobbler, Katahdin, and Sebago varieties grown in commercial fields. A test with 40 seedlings at the farm of Willard Wiltse on a sandy soil revealed interesting reaction to net necrosis. The following seedlings were free from necrosis and will be tested further: B 81-40, B 69-2, B 311-44, B 143-14, 1389-18, R 50-16, and R 100-3. Many of the seedlings discarded were affected to such a degree as to make them useless for commercial production.

Michigan seedling, 125-4, a high-yielding promising early seedlings had possibilities for introduction but necrosis has eliminated the possibility of this seedling becoming prominent unless it is grown in the areas of cooler climate and confined to the heavier soils.

Quality

Culinary quality was made on all the seedlings grown to determine the dry-matter content and the degree of discoloration. The dry-matter content was determined by specific gravity readings, and discoloration was determined by the alcohol test. Plugs taken from the tubers were soaked in 95% grain alcohol for a time, and the readings were recorded. One hundred four seedlings selected at the Reisner farm, Rogers City, for high dry matter were again tested, and they were all similar to tests made in previous years.

OVERSTATE TESTS

H. C. Moore, L. V. Nelson, J. F. Davis

The large acreage of muck or peat soils in Michigan and the increased development over the past few years has raised the question regarding the variety to grow. Four tests on muck soils were planted in each of four counties. Michigan table 1 gives the total yield of the varieties and seedlings grown.

Chippewa and Katahdin varieties are the most widely grown on muck in Michigan. The Sebago variety has been grown by a few growers the past 2 years. The mealy tubers and the slight scab resistance and the blight resistance of the Sebago have been the reason for the change. Seedling AFY-4 has been used in the experimental plots to determine the value of different fertilizing elements. It is a soggy, dark, cooking potato with little commercial value.

Michigan table 1. Total yield of seedlings and varieties on muck soil in four counties of Michigan.

Variety	Total yield per acre			
	Allegan	Jackson	Newago	Lapeer
	Bu.	Bu.	Bu.	Bu.
Chippewa	537	595	442	719
Katahdin	356	626	388	674
Sebago	596	573	335	729
125-4*	233	612	332	661
529-2*	399	605	368	---
Pontiac	422	575	438	662
Kennebec	504	187	434	737
AFY-4**	278	401	349	772

* Michigan seedlings
**Seedling obtained from Dr. Reddick.

Acceptance of New Varieties by Commercial Growers

The acreage of potatoes in Michigan has been decreasing. The acreage planted to Russet Rural variety has decreased even more than the decrease in acreage. The Rural variety has been replaced by many of the new varieties. The acreage of Katahdin, Chippewa, Menominee, and Sebago varieties has increased in the order listed. The Menominee has the least chance of survival because of the poor market quality.

Supplemental irrigation has done more to promote the use of the Sebago variety than any other practice. The slight scab resistance and the ability to produce high yields, along with excellent cooking quality, make it desirable for planting more of the Sebago variety. The short rest period making for early sprouting is one of the chief objections. Many growers market the Sebago crop before the holiday season and resort to the Katahdin variety to supply the customers during the winter months.

MINNESOTA

F. A. Krantz, Carl J. Eide, W. A. Oitto, Paul R. Fridland,
H. D. Thurston, and Fred A. Gowen

The general objectives of the breeding work are to develop varieties having adaptation to major producing areas of the State, improved market appeal, culinary quality, and resistance to scab, late blight, and virus diseases. Fair progress has been made in combining and fixing the characters that are involved in adaptation, market appeal, and resistance to scab.

Tests at 5 locations in the State of a group of selections indicated that 27 selections had resistance to scab of type 2 (Jubel) or better, the yield appeared to be equal, and the attractiveness of the tubers superior to the commercial varieties. It is hoped to reduce this number of further screening in growers' adaptation trials in 1950.

Breeding work is in progress to combine resistance to late blight with the above combinations. Tests at 2 locations in 1949 showed that 12 selections, having late blight resistance, had sufficient promise in adaptation and other desirable characters to warrant their placement in growers' adaptation tests. Combinations between the most promising of the selections resistant to scab and late blight are in the crossed-seed and first-year seedling stage.

Adaptation of Varieties

W. A. Oitto

Potato variety trials are conducted each year by the Minnesota Agricultural Experiment Station in cooperation with the branch stations at Crookston and Grand Rapids and with various potato growers throughout the State. The objective of these trials is to determine how different varieties behave under the growing conditions in the major potato-growing areas of the State. Varieties included in the tests are of three sorts: old standard varieties whose qualities and growth characteristics are known; new named varieties and selections from other stations; and new varieties and promising advanced seedling selections from the Minnesota Agricultural Experiment Station. The test gives an opportunity to compare the new varieties and selections with the older accepted ones as to growth characteristics, yield, and specific gravity.

In 1949, 24 varieties and selections were grown at 5 different locations in the State. In the Red River Valley the locations were at Crookston and Glyndon. In the late region the locations were at Grand Rapids and Castle Danger. One location on peatland was at Hollandale.

The yields of the highest-yielding varieties tested in 1949 are given in Minn. table 1. They have been divided into three maturity groups: extra-early, early and second-early. In the extra-early group, Red Warba, which was used as a standard, did not yield significantly above Wasecа and Minnesota 23, although it had a greater mean yield. The tuber type of both

Wasecа and Minnesota 23 is superior to that of Red Warba. On a relative scale of 1 to 5, measuring general desirability and smoothness, the average rating of Red Warba at five locations was 3.6, whereas Wasecа and Minnesota 23 were 2.2 and 3.2, respectively. The mean specific gravity of Red Warba was significantly higher than that of both other varieties (see Minn. table 2).

Minn. table 1. Comparison of yields of eight potato varieties grown at three major potato-growing areas of Minnesota in 1949.

Maturity and variety	Yield per 100 hills and location			
	Red River Valley	Peatland	Late Region	Mean
	Pounds	Pounds	Pounds	Pounds
Extra Early				
Red Warba	190	232	239	250
Wasecа	169	264	245	231
Minn. 23	184	216	207	203
Early				
Cobbler	204	242	217	220
Chisago	194	193	234	214
Second Early				
Pontiac	198	199	259	229
Satapa	209	323	201	233
Chippewa	190	232	210	210
Mean	192	238	227	

Least significant differences	5% level
Between varieties and locations	113
Between means of varieties	56
Between means of locations	24

Minn. table 2. Comparisons of specific gravity of eight potato varieties grown at three major potato-growing areas of Minnesota in 1949.

Maturity and Variety	Location and specific gravity			
	Red River Valley	Peatland	Late Region	Mean
Extra Early				
Red Warba	1.084	1.066	1.066	1.072
Wasecа	1.077	1.061	1.060	1.066
Minn. 23	1.073	1.056	1.062	1.064
Early				
Cobbler	1.090	1.066	1.077	1.078
Chisago	1.085	1.059	1.060	1.069
Second Early				
Pontiac	1.081	1.050	1.061	1.063
Satapa	1.082	1.065	1.068	1.071
Chippewa	1.084	1.052	1.065	1.067
Mean	1.082	1.059	1.065	

Least Significant Differences	5% level
Between varieties and locations	.009
Between means of varieties	.005
Between means of locations	.002

Minnesota 23 is a round white variety with very low set which seldom produces undersized tubers.

Of the early varieties, no significant difference in yield was found between Cobbler and Chisago. The tuber type of Chisago is much superior to that of Cobbler. On general rating for smoothness and general desirability, Chisago received an average rating of 2.6 from five locations, while that of Cobbler was 3.4. The mean specific gravity of Cobbler was significantly higher than that of Chisago (see Minn. table 2).

In the second-early group, there was no significant difference in yield between any varieties. Pontiac had an average tuber general desirability rating of 2.6. That for Satapa was 2.7 and for Chippewa 3.3. The mean specific gravity of Satapa was significantly higher than that of Pontiac, and this was also true in the peatland area. Satapa has consistently shown for a number of years a higher specific gravity than that of Pontiac.

The late varieties Kennebec and Teton were also tested in 1949. Kennebec was the highest-yielding named variety in the tests in the late region with a mean yield of 302 lbs. per 100 hills. It gave satisfactory yield in the peatland area with a mean yield of 204 lbs. and was low in the Red River Valley area with a mean yield of 149 lbs. per 100 hills. Teton gave satisfactory yield in the late region with a mean yield of 215 lbs. per 100 hills, but gave low yields in the peatland and Red River Valley areas, with 190 and 154 lbs. per 100 hills respectively.

Minn. table 3 gives the yields of these 8 varieties for the years 1947, 1948, and 1949. A test in the Red River Valley of a large number of varieties and selections was made jointly by the Minnesota and North Dakota Experiment Stations and the United States Department of Agriculture. The results of this test are being reported by O. C. Turnquist.

Minn. table 3. Mean yields of eight potato varieties grown at three major potato-growing areas in Minnesota in 1947, 1948, and 1949.

Maturity and Variety	Mean Yield per 100 hills and location			
	Red River Valley	Peatland	Late Region	Mean
	Pounds	Pounds	Pounds	Pounds
Extra Early				
Red Warba	179	272	164	202
Waseca	140	270	160	191
Minn. 23	164	282	168	200
Early				
Cobbler	190	290	184	218
Chisago	176	253	191	203
Second Early				
Pontiac	181	344	232	246
Satapa	176	319	188	222
Chippewa	179	253	211	209

Studies on Late Blight in Relation to Potato Breeding

Paul R. Fridlund, H. D. Thurston, and Carl J. Eide

Five selections (Ac. 39.5, TI-5, B61-3, B 70-5, and B 96-56) were inoculated with field collections of Phytophthora infestans in the greenhouse. Inoculum was increased on Cobbler plants. Dark lesions, usually less than 3 mm. in diameter, were the only foliage symptoms resulting from these inoculations, and sporulation was never observed on such lesions.

If flowering plants were inoculated, the blossoms of all five selections became infected, and the fungus sporulated on the infected flowers about 3 days after inoculation, either on the plant in the greenhouse or on detached flowers in a moist chamber. These sporangia were used to inoculate the foliage of the plants from which they came, but no symptoms were observed more severe than flecks like those mentioned above. Blossoms of Datura stramonium, Nicotiana glutinosa, and Lychnis alba could also be infected by inoculum from Cobbler, but no foliage infection was observed on any of these species. Neither blossoms nor foliage of Nicotiana rustica, Physalis floridana, strawberry nor alfalfa were infected in experiments similar to those above.

It is apparent that the blossoms of resistant potato clones and certain other species of plants are more susceptible to late blight than is the foliage, but parasitism on the floral organs did not seem to have resulted in the adaptation of the fungus to increased parasitism on the foliage.

As indicated above, no collections of P. infestans have been found in Minnesota that produce more than very small flecks on highly resistant selections like TI-5. Some of these produce small lesions with spores on less resistant varieties like Essex. Other collections of the fungus produce no symptoms whatever on TI-5 etc., and are only slightly pathogenic or non-infectious on Essex. These are indications that there are parasitic races of P. infestans in Minnesota, but a more precise definition of the parasitic capabilities of such races has not yet been made.

A moderately heavy epidemic of blight was started in the field at Castle Danger by placing infected potted Cobbler plants among those growing in the field. Susceptible varieties had up to 100 percent of the foliage infected. Sebago averaged about 12 percent infected foliage, while Essex, Chenango, Kennebec, and more resistant varieties and selections were not infected.

Tubers of over 200 varieties and selections were inoculated by dipping in a suspension of sporangia and zoospores of P. infestans. Inoculations were made 2 days after digging, and each selection was put in a waxed bag to serve as a moist chamber, and kept at 65° to 70° F. Half of each selection (3 - 4 tubers) was handled carefully to prevent bruising, and the other half was shaken in a wire basket to bruise the tubers slightly. Only 5 of over 200 varieties and selections that were not injured became infected, while 85 of those slightly wounded were infected. Among these were 96-56, Virgil, and Kennebec. Seven weeks after the first inoculation, all tubers

not infected were wounded by scratching lightly with insect pins and inoculated again. This resulted in the infection of part or all of the tubers of 125 clones. Apparently slight wounds are required for infection of tubers after harvest. The fact that some tubers of many clones became infected while others of the same clones escaped indicates that improvement in testing techniques is necessary.

Minn. table 4. Mean specific gravity of eight potato varieties grown at three major potato-growing areas of Minnesota in 1947, 1948, and 1949.

Maturity and Variety	Location and specific gravity			
	Red River Valley	Peatland	Late Region	Mean
Extra Early				
Red Warba	1.085	1.068	1.071	1.077
Wasecа	1.075	1.063	1.070	1.069
Minn. 23	1.075	1.060	1.062	1.069
Early				
Cobbler	1.089	1.069	1.078	1.079
Chisago	1.081	1.065	1.074	1.074
Second Early				
Pontiac	1.075	1.056	1.070	1.068
Satapa	1.079	1.064	1.071	1.073
Chippewa	1.080	1.060	1.069	1.071

NEBRASKA

H. O. Werner, Harold Chapman, Roger Sandsted, and Robert O'Keefe

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The breeding program, aimed primarily at the production of a scab-resistant red-skinned early-maturing variety with superior quality, has been continued. The general nature and scope of the work has been as follows:

1. Seed production in greenhouse, 233 crosses, almost exclusively of red lines of high specific gravity and good type with scab-resistant lines or varieties.

2. Production of 12,000 seedling tubers in greenhouse.

3. First-year field increase of seedlings (12,000) at Scottsbluff; all tubers of 251 segregates saved; one tuber from each of 3,298 segregates of 178 families with scab-resistant parentage saved for testing in scab-infected soil in 1950.

4. Testing program:

   a. For scab resistance, tuber units of 4,009 segregates of 123 families of 1948 crosses and 425 clones of earlier selections or varieties planted on heavily scab-infested soil at Scottsbluff (irrigated). Rows of Triumph and Progress were planted on opposite sides of each trial row as highly susceptible and partly resistant checks. Tubers from 249 segregates from 88 families were saved for further testing.

   b. Adaptation tests:

      (1) Clonal line observation tests, 10 hills each.

         (a) Box Butte Experiment Farm, dryland 4,000 feet, 578 clonal stocks including 123 new stocks from other sources (in quarantine plot).

         (b) Scottsbluff Field station, irrigated 4,000 feet. About 500 clonal lines, 10 hills each.

         (c) Lincoln, 1,100 feet, early potatoes, 125 clones.

      (2) Large scale tests of advance lines:

         (a) Major increase of 139 selected clones, 50 to 2,000 hills, Box Butte, dryland.

         (b) Advance clones and new varieties, Scottsbluff irrigated, 40 lines, 200 to 2,000 plants.

      (3) Outstate tests, 20 to 40 varieties or advance clones in 22 observation or yield tests at 14 sites across the State, 900 to 5,400 feet altitude, on dryland and irrigated, early and late crops, and some on 4 planting dates.

c. Insect resistance or susceptibility tests (mostly by Dr. Roscoe A. Hill of Entomology Dept.).

(1) Flea beetle for resistance to injury to tubers by larvae. Two hundred eighty clones planted in early June at Scottsbluff. Several segregates have been found to show very high or intermediate resistance in more than one year. The Doe Bay Red variety is highly resistant and although of miserable tuber type a number of segregates of good type and red color have been harvested in January from crosses made with it in February 1949.

(2) Susceptibility to leaf hopper damage. Seven varieties growing at Lincoln were benefitted greatly by spraying but some varieties responded very much more than others.

d. Heat and drouth endurance tests of 145 clones in heat machine at Lincoln.

e. Food or culinary quality tests:

(1) Cooking quality - To determine acceptability of lines up for introduction. Some 60 families cooperated and evaluated paired samples (blind numbers) of 3 clones against 2 varieties. The acceptability reported for 2 advanced lines aided in deciding on their naming and introduction.

(2) Ascorbic acid analysis of tubers of 173 segregates, mostly from 1947 crosses. We are constantly finding segregates with higher values than those of commercial varieties. These are utilized in crossing, and lines with low values are avoided. (All analyses were made by Marilyn Kuhlman and Mary R. Gram of the Food and Nutrition Division of this station.

(3) Specific gravity determinations of tubers of hills all saved from seedling plats and from most of the semi-advanced lines grown with and without irrigation. Many of the seedling clones have very high specific gravity values and few have values lower than Triumph.

5. Preintroduction increase of seed stocks of advance lines:

In cooperation with the Nebraska Certified Potato Growers Cooperative foundation seed department.

a. Thirty thousand bushels of Progress were distributed to about 150 growers the first growing season after the variety was named.

b. Seed stocks of 5 to 6 advance lines are being built up by tuber index and isolated tuber unit seed plot technique.

6. Study of water usage by different varieties. Each of nine varieties were grown in randomized plots in 4 blocks (25 plants of each variety in each plot-total of 36 plots) on dryland at the Box

Butte Experiment Farm. Soil moisture determinations were made at intervals to determine the amount of moisture used by the plants of each variety. The results are in the process of compilation.

Status of Development of Lines with Early, Red Scab Resistant Tubers

A large number of red-tuber seedlings have been produced annually since 1942. With each succeeding year the proportion of red tuber lines has increased, the color of most has been darker, more have been early or midseason, and type has improved. Tubers of most of the segregates increased since 1943 have higher specific gravity and many have considerably more scab resistance than Triumph.

Most of the good red lines trace back to Minn. 5-10-3-23-2 (Peerless x Lookout Mt.). As grown in western Nebraska this line is very susceptible to scab. Other sources of red have been Colorado 1485 (Triumph x Earlaine) and Minn. 53-35. All of these have had many good type tubers in their progenies.

Scab resistance has been derived from using Hindenburg as one of the parents or grandparents and from the Minnesota 5-10-3 lines.

One of the most fruitful parents, used extensively starting with 1946, has been 117.43-3. This line has red tubers of fair type and is somewhat late. It seems to have considerable scab resistance in Nebraska. It produces an abundance of fertile pollen. Tubers generally have high specific gravity. The range of characteristics of the segregates being continued from 15 of the 1947 crosses are shown in Nebraska table 1.

A number of segregates of 1948 with 117.43-3 are of comparable merit.

During the 1950 crossing seasons and probably during the next few years we plan to concentrate on getting more scab resistance into these red lines. We also need to reduce the number of tubers setting, for most of the lines set too heavily and tubers are smaller than is desirable.

Performance of Newer Varieties in Nebraska

The following qualitative observations on the performance of the newer varieties of potatoes grown with and without irrigation in western Nebraska may possibly be of more value to workers in other places than tabular reports.

The detailed data on which these observations are based are found in Neb. tables 2, & 3, which are based on large plots located at two of the experiment stations and in tables 4, 5, & 6, which are based on results from 21 plots located at various places in Nebraska. Nebraska table 7 gies the data for yield and quality of a number of promising selections grown in comparison with Progress and Triumph.

Nebr. table 1. Characteristics of red-tuber progenies being continued from 15 crosses with Nebraska 117.43-2 as pollen parent. Description based on tubers grown on dryland at the Box Butte Experiment Farm.

1947 cross	Female Parent1/	No. of lines	Maturity	Tuber Color	Scab		Specific Gravity	Ascorbic Acid	Other Characters
					Type	Incidence			
127	73.37-4	4	4-10	5-10	0-10	0-4	77-82	Med.	Large tubers
129	Progress	3	5-10	1-8	2-5	1-2	92-97	Med.	Large tubers
131	101.40-3	8	1-9	3-9	1-5	1-4	80-110	Low	Some fertile
132	120.40-6	1	1	9	2	2	86		Fertile
134	59.41-P1	1	2	9	2	1	91		
137	85.41-1	4	1-5	2-7	2-4	1	80-96	Med.	Some fertile
139	21.42-1	1	9	5	7	1	91		
141	216.43-2	5	5-10	3-10	3-7	1	75-91	Med.	Large tubers
142	225.43-1	6	2-9	4-10	0-9	1-4	81-94	Med.	Some fertile
143	311.43-1	13	1-10	3-10	0-9	0-2	83-115	Low-high	Some large
146	60.44-2	1	8-10	4-	8	2	95		Flea Beetle resistant
149	B 21	3	4-9	4-9	3-10	1	86-91		Very large tubers
151	White Cloud	5	0-9	1-7	1-10	1-4	84-91	Low	
154	Kasota	5	2-7	1-9	1-8	1	87-94	Med-high	Some large tubers
155	Mohawk	1	5	6	2	1	94		Large tubers
	Triumph		3-4	3-5	6-10	1-7	70-80	Med.	
	Progress		3-4	6-8	1-3	1-3	70-80	Med.	

Significance of code numbers for various characters.
Maturity: 1 = Very early; 10 = Very late.
Tuber color: 1 = faint red; 10 = very dark red.
Scab: Type: 1 = minimum lesions; 5 = severe surface pustules; 7 = slight pits; 10 = very deep pits.
Incidence: 1 = bare occurrence, 10 = covering most surface of most tubers.
Specific Gravity: 1.0 omitted.

Nebr. table 2. Yield and quality of new varieties as compared with Triumph and Progress grown on dry land at the Box Butte Expt. Farm 1949.

Variety	Total Yield per acre	U.S. No. 1	Tubers over 1 7/8 inches sorted out because of defects.		Specific Gravity
			Scab	Other defects 1/	
	Bu.	Pct.	Pct.	Pct.	
Progress	239	59	9	12	1.075
Cayuga	189	65	1	20	1.090
Chisago	209	46	34	14	
Triumph	260	38	31	25	
Chippewa	222	43	40	9	1.081
Marygold	190	59	25	10	1.076
Menominee	93	77	8	14	1.085
Essex	221	55	22	5	
Progress	249	54	15	12	
Mohawk	197	45	33	14	
Kasota	230	64	21	6	
Triumph	214	42	25	24	
Kennebec	237	29	9	56	1.083
Seneca	40	40	2	31	
Satapa	237	59	12	21	
Sebago	167	58	19	12	1.073
Progress	272	44	20	23	
Rus. Sebago	-	76	2	10	
Red Pontiac	262	67	7	24	1.073
Irish Cobbler	249	11	43	41	
Triumph	229	3	88	4	
Ontario	187	57	1	33	
Triumph 12	255	3	88	4	
Waseca	213	11	74	11	
Progress	232	60	18	12	
Yampa	214	62	14	15	
Triumph	241	23	55	12	
Red Warba	200	6	63	20	1.085
Katahdin	210	21	64	11	
Triumph	240	40	36	20	

1/ Other defects were rough, field cut, field crack, and sun green.

Nebr. table 3. Market quality of some new varieties and promising selections in comparison with Progress checks in irrigated plats at Scottsbluff in 1949. Yields not reported because lots were planted in single plots of variable size. All lots were planted on dates deemed best for their characteristics.

Variety	U. S. No. 1	Tubers over 1 7/8 inches sorted out because of defects		Specific Gravity
		Scab	Other defects 1/	
Planted May 22	Pct.	Pct.	Pct.	
Ontario	62	3	27	1.077
Menominee	62	4	28	1.072
Sebago	65	7	24	1.073
Rus. Sebago	68	10	14	1.078
Katahdin	55	12	28	1.071
Kennebec	21	17	53	1.070
Progress	47	26	8	1.068
Planted June 4				
Cayuga	53	0	33	1.082
Seneca	31	5	52	1.078
Yampa	40	1	52	1.068
Katahdin	60	2	31	1.068
Kennebec	27	6	57	1.070
Progress	57	14	13	1.073
Planted June 16				
38.42-3	67	6	14	1.067
Kasota	74	4	17	1.068
311.43-1	55	5	9	1.080
204.43-1	81	4	5	-
25.42.2	68	12	8	1.069
225.43-1	51	36	4	1.076
140.42-1	62	13	17	1.067
209.43-1	74	8	6	1.067
213.43-2	49	32	3	1.070
213.43.3	56	24	10	1.072
217.43.1	72	11	5	-
60.44-2	46	13	2	1.066
Mohawk	77	3	14	1.075
Waseca	56	32	7	1.068
Satapa	36	32	25	1.068
Chisago	26	47	21	1.069
Triumph	40	27	20	1.071
Progress	68	4	8	-
Planted June 25				
120.40-6	72	3	10	1.082
49.40-1	58	18	14	1.071
43.41-1	63	22	7	--
85.41-1	65	11	16	1.071
White Cloud	76	3	8	--
Progress	63	1	14	--

1/ Other defects = rough, field cuts, field cracks, and sun green.

Nebr. table 4. Percentage of US#1 A size tubers and mean specific gravity of 22 varieties tested in Nebraska in 1949.

Variety	US#1 Grade, A size			Mean Specific Gravity				
				Late Crop			Early crop	
	Western Nebraska		Central Nebraska	Central Nebraska	Scotts-bluff	Box Butte	Central Nebr.	Central Nebr.
	Eight Irrig. Plats	Five Dryland Plats	Three Irrig. Plats	Two Dryland Plats	Irrig. Plant. June 16	Dryland Planted June 17	Three Irrig. Plats	Two Dryland Plats
	Pct.	Pct.	Pct.	Pct.				
Cayuga	58	59	46	23	90	100	80	--
Ontario	47	43	49	40	69	89	72	61
Menominee	52	49	39	49	67	94	85	69
Rus. Rural	52	--	--	--	72	--	--	--
Yampa	48	63	74	45	72	99	71	71
Rus. Sebago	55	59	65	51	75	92	62	65
Progress	45	53	33	27	67	86	65	70
Kennebec	36	41	57	65	72	96	73	74
Kasota	54	61	--	--	72	90	--	--
Katahdin	42	48	70	62	74	92	68	69
Chisago	34	46	73	41	68	79	66	--
Essex	39	36	56	35	70	88	60	--
LaSoda	39	63	75	--	68	82	69	68
Waseca	44	49	78	46	68	78	63	65
Satapa	42	55	72	48	68	80	70	71
Pontiac	35	54	56	59	64	81	60	58
Pawnee	41	48	73	40	70	83	71	72
Irish Cobbler	30	63	74	50	75	85	74	84
Red Warba	24	56	73	47	73	79	71	74
White Cloud	38	41	77	46	67	82	73	75
Triumph	34	46	64	27	74	80	62	63
Mohawk	34	39	64	64	67	90	78	73

Nebr. table 5. Percentage A-size scabby tubers was of total crop in Nebraska trials in 1949. Values are means of percentages of designated number of plats.

Variety	Late Crop						Early crop	
	Western Nebraska 9 irrigated plats			Western Nebraska 6 dryland plats			Central Nebr. Total Scab	
	Slight	Medium	Severe	Slight	Medium	Severe	3 Irrig.	2 Dryland
Cayuga	1	1	0	.3	.3	0	0	0
Ontario	2	.1	0	.3	0	0	0	0
Menominee	3	2	.3	.4	.1	.3	2	.3
Rus. Rural	5	.5	2	--	--	--	--	--
Yampa	8	1	1	1	2	1	0	0
Rus. Sebago	11	1	.2	1	2	0	0	0
Progress	10	7	1	2	2	1	0	10
Kennebec	8	9	2	2	2	2	.3	0
Kasota	9	12	4	4	4	3	0	--
Katahdin	13	12	3	4	6	2	1	1
Chisago	19	14	2	3	12	10	1	4
Essex	14	12	4	2	7	3	0	0
LaSoda	17	15	2	4	7	2	0	--
Wasecа	14	17	2	6	7	3	0	0
Satapa	11	16	6	4	6	4	0	.2
Pontiac	11	15	8	2	9	7	4	0
Pawnee	13	19	5	5	8	6	1	2
Irish Cobbler	--	--	-	-	-	-	.4	4
Red Warba	--	--	-	-	-	-	1	3
White Cloud	13	22	5	8	10	6	.3	2
Triumph	12	19	7	3	7	6	3	11
Mohawk	6	19	9	6	10	5	0	0

Nebraska table 6. Mean yield in bushels per acre of U.S.#1 A size tubers in Nebraska trials in 1949.

Variety	Western Nebraska		Central Nebraska	
	Eight irrigated plats	Five dryland plats	Three irrigated plats	Two dryland plats
	Bu.	Bu.		
Cayuga	146	109	146	20
Ontario	126	65	197	51
Menominee	171	73	89	136
Rus. Rural	130	--	--	---
Yampa	151	124	261	46
Rus. Sebago	136	93	167	70
Progress	157	92	92	32
Kennebec	131	103	219	138
Kasota	191	107	---	---
Katahdin	125	71	217	101
Chisago	55	53	239	55
Essex	168	85	268	30
LaSoda	147	136	249	---
Waseca	132	59	196	74
Satapa	101	83	222	48
Pontiac	128	132	271	119
Pawnee	122	78	306	54
Irish Cobbler	25	128	285	77
Red Warba	17	119	309	87
White Cloud	113	58	362	47
Triumph	123	75	252	25
Mohawk	82	57	209	58

Nebraska table 7. Yield and quality of some promising selections in comparison with Triumph and Progress checks. Dryland, Box Butte Farm, 1949.

Variety or selection 1/	Yield per acre		Pct. of total yield by size and condition classes			Specific gravity
			A size, over 1 7/8 in.			
				Defective tubers sorted out		
	Total	US #1 A	U.S. #1	common scab	Other defects	
	Bu.	Bu.	Pct.	Pct.	Pct.	
Triumph 2/	211	78	37	27	29	
Progress 2/	228	113	50	18	14	
190.38-6	278	167	60	16	19	1.062
15.40-2	250	159	64	8	20	1.078
Triumph	250	122	49	25	19	
120.40-6	228	135	59	14	12	1.082
Progress	242	122	50	22	12	
85.41-1	211	144	68	6	18	1.074
Triumph	231	102	44	27	23	
20.42-9	165	119	72	6	14	1.084
Progress	198	97	49	9	9	
25.42-2	181	100	55	17	5	1.081
Triumph	214	111	52	25	16	
140.42-1	196	107	55	23	10	
Progress	194	94	48	9	11	
213.43-2	208	108	52	28	6	1.086
213.43-3	209	123	59	23	7	1.078
Triumph	220	115	52	26	16	
22.43-1	216	105	49	38	4	1.087
Progress	199	103	52	12	12	
311.43-1	177	84	48	15	5	1.098
20.44-2	171	116	68	6	18	1.066
Triumph	194	107	55	15	21	
26.44-1	199	136	68	14	6	
273.44-2	160	87	54	7	12	1.076
189.45-6	217	145	67	8	14	
Progress	239	141	59	9	12	

1/ Description of selections in accompanying text.
2/ Rows of Triumph or Progress planted at intervals throughout the test.

Cayuga tubers have been practically free of scab, of good type and always among the very highest in specific gravity.

Chippewa produced a good total yield but low yield of US#1 because of heavy scab damage.

Chisago tubers were large but generally deep-eyed, rough, and among the most susceptible to scab. Because of these characteristics and being a white potato, it has no appeal to the Nebraska growers.

Essex produced too many small potatoes and was quite susceptible to scab. Tubers were very hard to loosen from stolons.

Kasota continues to produce high yields of very good type tubers. It generally has less scab than Triumph but more than Progress. If the supposed unattractive color has been responsible for the unacceptability of this variety, dyeing and waxing may help it because when so treated the attractiveness of the tubers is greatly improved.

Katahdin has shown relatively high percentages of scab, possibly higher than in some earlier years. An excessive percentage of the tubers have been partly green because of being too close to the surface.

Kennebec has been fairly satisfactory with irrigation in west-central Nebraska. It did very poorly in both dryland and irrigated areas of western Nebraska. In all places the tubers have had both dorsal and ventrol surfaces depressed at the basal end which also has generally been pointed. A very high percentage of the tubers have been too rough for either US#1 or US#2 grades because of knobs or growth cracks or because they were pointed and spindle-shaped or crooked.

In the irrigated fields the percentage of sungreen potatoes was much greater than with Katahdin or Pawnee, the varieties that generally have highest percentages of green potatoes. Scab was less prevalent than with most varieties. It has shown much more susceptibility to wilt, probably due to one or more species of Fusarium, than any other variety or selection. With plantings made in late May or early June as high as 15% of the plants showed symptoms by late July; and 40 to 50% of the plants were dead by early September. Some commercial growers in central Nebraska have become sufficiently interested to want to give it a field scale test, but in western Nebraska it does not seem to warrant further consideration.

LaSoda produces good yields of medium to pale bright red tubers many of which are likely to be too large with irrigation but satisfactory on dryland.

Menominee always produces a relatively high percentage of US#1 potatoes, largely because of comparative freedom from scab and many large tubers. Specific gravity of tubers is generally high. Yields are frequently not satisfactory because of the long growing season required.

Mohawk has produced a high percentage of large good type tubers. It has been quite susceptible to scab but when planted in western Nebraska in mid-June with irrigation, scab has not been serious on Mohawk (in a field having 27% with Triumph) yet tubers have been large and yields good.

Ontario tubers were practically free of scab but generally too rough and too late to warrant serious consideration of this variety.

Pawnee, except for susceptibility to scab, is perhaps the best early white variety. Scab generally consists of one or a few very large pits. Cooking quality is very good.

Red Pontiac tubers were among the largest of any, many of them being too large. Scab incidence was relatively low, but yield of US#1 tubers was among the highest on dryland. This variety ranks high in tonnage but not so well in grade or culinary quality.

Red Warba continues to be the major variety in the early commercial areas. In western Nebraska, where most of the commercial potato area is between 3,800 and 4,200 feet altitude, crops of satisfactory quality have rarely been produced anywhere except in one dryland area which has an altitude of 5,200 to 5,400 feet. Scab and rough or growth-cracked tubers are always serious factors, but total yields are generally high.

Russet Sebago showed very high resistance to scab on dryland but with irrigation it had a relatively high percentage of scabby tubers.

Satapa tubers have generally been very good but it has shown too great a susceptibility to growth cracking and scab.

Sebago produced fairly good yields of US#1 tubers of good type but quite immature.

Seneca tubers were relatively free of scab but this variety is not suitable for Nebraska because of such a very high percentage of rough, sungreen or small tubers and low yield.

Waseca produced a low percentage of US#1 grade tubers of fair grade and culinary quality. Scab was the most serious defect.

White Cloud produced a good crop of good market and culinary quality. The tubers are relatively uniform in shape and size. The potatoes have high specific gravity and are good for baking. The chief defects are a tendency for apical dominance to seriously inhibit the growth of basal eyes, sometimes too heavy setting and for the cooked potatoes to lack bright color. It has no scab resistance. It is worth testing as a possible substitute for Cobbler where oversize and rough tubers mitigate against the latter.

Yampa was acceptable on dryland producing a high percentage of US#1 potatoes of good size. With irrigation a very high percentage of tubers were rough, growth cracked, hollow or sungreen so that the percentage of US#1 was low. It was highly resistant to scab with irrigation and on dryland.

Empire, Virgil, and Placid have been tested but found unsatisfactory. Irish Cobbler has practically been dropped as a commercial variety.

Characteristics of tubers of lines reported in tables 3 and 4

190.38-6 Light red, large tubers similar to Triumph, very high ascorbic acid.

15.40-2 Light red, fairly early, very high ascorbic acid.

120.40-6 Midseason to early white; has some fusarium resistance.

85.41-1 Very early pink tubers of very good type.

20.42-9 Early large red tubers.

140.42-1 Excellent type bright white midseason to early.

213.43-2 Early large medium red tubers, eyes medium to deep. Promising as replacement for Red Warba.

225.43-1 Midseason, dark red, very good type tubers.

311.43-1 Early to midseason, unusually dark red tubers that are wide and flat.

20.44-2 Dark red large tubers.

26.44-1 Red tubers.

273.44-2 Early white tubers with some scab resistance.

189.45-6 Early pale red large tubers.

Results in 1949 with the Progress Variety

The Progress variety was named in the fall of 1949. In the spring of 1950 approximately 30,000 bushels of seed potatoes of this variety was distributed to about 150 growers in western Nebraska. Prior to making the decision to introduce this variety it had been tested extensively in experimental plots at various places in Nebraska thruout 5 seasons and on a field scale with about 20 farmers in western Nebraska. Approximately 30,000 bushels was sold in carload lots to determine the marketability of the variety. The final decision to name and introduce it was not made till enough cars had been sold to convince us that the variety was very acceptable on the market. The results reported from farmers who grew both Progress and Triumph are found in Nebr. table 8.

Results from Trial Plots:

Results from the trial plots at 22 places in Nebraska and from various blocks at two western Nebraska Experiment Stations are given in tables 2 to 7.

Market Results:

The Progress is selling very well on mid-western markets. It always outsells the Triumph when the two are sold competitively. The customers

Nebr. table 8. Means of results reported by farmers who grew both Progress and Triumph in western Nebraska in 1949.

Factor	Number or paired comparisons*	Progress	Triumph	Progress better than Triumph
Total bu. per acre	54	358.2	359.3	1.1 bu.
US#1 bu. per acre	54	238.9 bu.	192.6 bu.	46.3 bu.
Percent US#1	35	66.7 %	53.6 %	13.1 %
Percent scab	56	4.4 %	15.5 %	11.1 %
Percent Mech. dam.	57	2.9 %	8.1 %	5.2 %
Percent Growth cracks	51	9.0 %	6.0 %	3.0 %
Percent B size	53	15.5 %	8.8 %	6.7 %

* Numbers of pairs are not the same for all factors because many farmers did not supply all the information requested.

seem to prefer it because of the better color, brighter appearance, shallower eyes and freedom from air checks (half-moon or thumbnail-type cracks) that develop in the dry atmosphere of retail stores. In numerous markets they are selling at better prices than the Triumph of the same grade.

There will be a large acreage of Progress in western Nebraska in 1950. The use of this variety in central and eastern Nebraska is emphatically discouraged because of the large number of small tubers produced when grown as an early crop.

Grading Record with Commercial Warehouses

Of the 515,105 cwt. that was shipped by western Nebraska warehouses prior to December 31, 1949, Federal inspectors report 20% more US#1 with Progress than with Triumph. The results are summarized in table 9.

Nebr. table 9. Warehouse comparison of Progress and Triumph shipped from western Nebraska up to December 31, 1949. Based on federal inspection reports. (Data compiled by Earl Barrios of Nebraska Potato Development Division)

Variety	Percent of total shipments			Total number cwt. sacks
	US#1	US#2	Culls	
Triumph	45	41	14	478,432
Progress	65	21	14	36,673

Value of Specific Gravity Determination from Seedling Hills

Some measure of the dependability of specific gravity determinations of the single hill of tubers selected in the first year in the field, when maturity varies greatly because of variable emergence, is gained from the distribution table, although all values for 1949 were much lower than for 1948.

Nebr. table 10. Distribution of segregates of 1947 crosses according to specific gravity of seedling hill in 1948 and clonal increase in 1949. All grown at Scottsbluff with irrigation.

Mean Specific Gravity 1948 Seedling Hills	Mean specific gravity 1949 First clonal increase				Total Each 1948 Class
	60.1 - 70	70.1 - 80	80.1 - 90	90.1 - 100	
100.1 - 1	1	4	4	3	12
90.1 - 100		14	16	3	33
80.1 - 90	9	29	14	3	55
70.1 - 30	3	12	3		18
60.1 - 70	1				1
Total each 1949 class	14	59	37	9	119

Mean specific gravity of Triumph in 1948, - 80.0, in 1949, 70.8.

There was a strong correlation between the mean specific gravity of tubers produced in the two seasons. There is small risk of losing any high specific gravity lines by discarding those that have low values in the seedling plot.

NEW JERSEY
John C. Campbell

Yield tests of potato varieties were conducted in a number of locations in New Jersey in 1949.

In a study of seed sources, a number of varieties were tested on the Ketcham Farm and the Perrine Farm. New Jersey table 1 gives the yield data for these tests. Considerable differences were found between the yields of different strains of the same variety. Chippewa #46 from the Starks Farms, Wisconsin, gave the highest yield, but on the Perrine Farm Chippewa #46 gave about the same yield of U. S. No. 1's as Katahdin #49, Katahdin #50, Chippewa #20, Kennebec, and Chippewa #1.

New Jersey table 2 gives the yield data for six varieties grown in cooperation with Young Farmers at five locations. The average yield for the tests shows that Ontario ranked first and Pawnee last. Ontario produced more than twice as many potatoes as Pawnee.

New Jersey table 1. Yields per acre of potato variety trials on the Ketcham Farm and Perrine Farm, 1949.

Variety	Source	Yield per acre			
		Ketcham Farm		Perrine Farm	
		U.S.1	Total	U.S.1	Total
		Bu.	Bu.	Bu.	Bu.
Katahdin #49	Starks Farms, Wis.*	288	372	169	219
Chippewa #46	do *	351	362	169	248
Katahdin #50	do "	255	335	167	227
Chippewa	Jeff Baldwin, Minn.*	210	332	---	174
Katahdin	C.E. Hussey & Sons, Maine	243	326	137	199
Chippewa #20	Starks Farms, Wis.*	---	---	172	229
Chippewa	C.E. Hussey & Sons, Maine	163	304	131	180
Russet Sebago	Red Dot Farms, Wis.*	235	302	152	192
Kennebec	USDA, Maine	178	299	174	234
Teton	Barnett Bros., Pa.	127	290	122	211
Chippewa #1	Starks Farms, Wis.*	159	288	170	236
Kasota	Fred Ehrman, Nebr.	84	277	91	190
Cobbler	C.E. Hussey & Sons, Maine	167	272	125	175
Satapa	B. Frank Harris, N.J.	178	271	125	178
Pontiac	Jeff Baldwin, Minn. *	189	269	---	173
Green Mountain	W.E. Woodman, Maine	150	255	113	167
Green Mountain	Starks Farms, Wis.*	---	---	105	190
Sebago	C.E. Hussey & Sons, Maine	166	253	93	147
Sequoia	C.E. Hussey & Sons, Maine	150	253	97	193
Cobbler	Jeff Baldwin, Minn.*	138	246	---	149
Ontario	J. W. Hopkins, N.Y.	85	243	119	215
Sebago	Jeff Baldwin, P.E.I.*	189	242	---	133
Katahdin	Jeff Baldwin, Minn.*	184	223	---	191
Erie	Lloyd L. Dugan, Pa.	88	215	106	197

(continued)

New Jersey table 1, continued.

Variety	Source	Yield per acre			
		Ketcham Farm		Perrine Farm	
		U.S.1	Total	U.S.1	Total
		Bu.	Bu.	Bu.	Bu.
Bliss Triumph	Jeff Baldwin, Minn. *	126	213	---	170
Satapa	North Central School,Minn.	123	210	98	140
Waseca	B. Frank Harris, N.J.*	128	208	164	199
Mohawk	Frank Mahan, Maine	141	205	149	191
Pawnee	B. Frank Harris, N.J.*	95	199	100	145
Waseca	North Central School, Minn.	126	196	143	177
Cobbler #29	Starks Farms, Wis.*	97	194	126	185
Cobbler #60	Starks Farms, Wis.*	107	184	120	177
Essex	Lake Placid Club Farms,N.Y.	131	180	81	129
Pawnee	Frank Shaw, Maine	51	141	104	155
Red McClure	Colo. A & M College,Colo.*	15	104	---	---
Canus	Dominion Expt. Sta.,N.S.*	---	---	152	201
Yampa	Colo. A & M College,Colo.*	---	---	59	95
Marygold	R. A. Jehle, Univ. Md.*	---	---	139	181
B 355-44	U.S.D.A., Maine*	---	---	144	184
B 351-44	U.S.D.A., Maine*	---	---	116	181
B 73-10	U.S.D.A., Maine*	---	---	132	164
B 76-43	U.S.D.A., Maine*	---	---	140	194
B 61-3	U.S.D.A., Maine*	---	---	110	165
Md. 13-129	Univ. Maryland*	---	---	148	178

* Donated

New Jersey table 2. Yields of Young Farmers' potato variety test plots.

Variety	Location and total yield per acre						
	Carleton Cubberley, Cranbury	Arthur Applegate, Robbinsville	Robert Rozel, Highstown	Orville Dey, Cranbury	Mount Hutchinson, Allentown	Average yield	Average U.S. #1
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Pct.
Ontario	151	609	411	356	222	349.8	48.1
Pawnee	103	194	145	222	97	152.0	64.2
Teton	141	498	90	368	206	260.0	64.6
Essex	160	---	320	---	208	229.3	70.8
Mohawk	158	353	291	245	221	273.6	69.2
Katahdin	192	590	304	248	---	333.5	75.5

NEW YORK (Cornell)

F. M. Blodgett, D. A. Roberts, and J. J. Natti

Only a few seedlings from previous tests were retained for testing in 1949, and no new ones bred for scab resistance were added. Two seedlings new in these tests were included, which were provided by Dr. Livermore. They were bred for resistance to spread of leaf roll and selected for high yield and other desirable commercial characters. These seedlings, 3908 and 2V2452, were included to get a reading on their reaction to scab.

These tests were made possible by the cooperation of Orson Robson at Hall, L. T. Dunn and Son of West Henrietta, and Andrew Schuler of Cato.

These plots were planted by hand in rows opened and fertilized with a planter. They were cultivated and sprayed as parts of larger fields. Some roguing of plants with virus diseases was practiced, particularly in those plots from which it was planned to save seed, but few plants were removed as the seed had been indexed in the greenhouse to free it from these diseases. A good stand was obtained with most of the seedlings, but Ia 116-16 again gave a poor stand as it has in several previous years. A rather slow come-up was also obtained, presumably because the seed had not been warmed up and sprouted sufficiently before planting. Volunteers were troublesome on the peat soil at Schuler's where the conditions had been such that numerous small tubers had survived the winter in the soil.

The test at the Robson Farm

Ten varieties were planted in this test, each in 4 replications of 15 hills each. Two of these, the Rurals and Katahdins, were standard varieties. Ontario was also included for comparison of scab resistance. Only Ontario and the 3 seedlings Ia 116-16, B 395-5, and Col. 6332, that were selected here in previous tests, showed a high degree of scab resistance. The Kennebec and seedling B 434-127, which had seemed to have some resistance in a test in 1948 at the Dunn Farm, under the conditions here, showed a high percentage of scab culls, as well as a high total percentage of tubers scabby. Both of Dr. Livermore's seedlings (No. 3908 and 2V2452) had about 61% scab culls and over 90% total scabby which was a little more scabby than the Rural but less scabby than Katahdin. Aside from scab culls these seedlings gave good yields of tubers of good shape.

In N. Y. table 1 the varieties and seedlings tested have been arranged in the order of the production of net saleable potatoes; i.e., the potatoes of No. 1 size from which the scab culls and misshaped tubers have been removed. In this arrangement Ontario is well out in front, followed in order by Ia 116-16, Col. 6332, and B 395-5, all of which are highly scab-resistant. The remaining varieties had good total yields but lost heavily from the removal of scab culls.

N. Y. table 1. Results of tests of scab-resistant seedlings at Robson's Farm, in 1949.

Variety	Yields per acre corrected to average stands	No. 1 size	Scab culls	Cracked & knobby tubers	Net saleable per acre	Total scabby	Rhizoc. Maturity 0= dead 10= green	
	Bu.	Pct.	Pct.	Pct.	Bu.	Pct.	Pct.	
Ontario	519.3	98.2	4.2	11.8	479	32.5	18.5	8.6
Ia 116-16	395.1	97.0	.7	10.3	341	71.3	2.8	9.3
Col 6332	358.0	91.8	.2	10.0	295	45.0	40.0	3.6
B 395-5	365.3	97.1	2.5	18.0	284	50.5	8.3	9.2
3908	458.1	94.8	61.7	6.0	156	92.3	34.0	6.8
Rural	365.7	92.0	49.2	8.8	156	87.0	27.3	2.9
2V2452	413.1	94.2	60.7	4.0	147	90.0	56.8	5.0
B 434-127	435.2	97.7	60.5	16.8	140	94.0	59.8	6.1
Katahdin	443.2	97.7	71.8	1.3	121	93.8	38.0	2.5
Kennebec	403.9	96.6	77.0	13.0	78	92.8	45.8	1.6
Least Significant Difference 5% level	89.2	3.0	14.6	4.9		11.2	26.8	

Test at the Schuler Farm

This test consisted of 7 varieties and seedlings planted in 4 replications of 25 hills each on peat soil that was supposed to be heavily infested with scab organisms. Two other varieties were included of which seed was not available for the full number of replications. In addition, the ends of one set of 4 plots were lost at digging time so that they could not fairly be included in the yield data, though enough tubers were harvested to provide samples for grading for tuber defects.

Good yields (N. Y. table 2) were obtained but the fact that the earlier varieties tended to outyield the late varieties suggests that the late varieties might have done better if the seed had been less dormant when planted. Thus Kennebec, Katahdin, Col. 6332, and Cobbler gave the larger total yields, although these are all earlier than Ontario, Ia 116-16, Seneca, and B 395-5. In most tests these late varieties have given bigger yields.

Only enough seed was available for one plot of Kennebec, but it was exceptionally high yielding here. There was only a 2 percent loss from scab culls but a 20 percent loss due to misshaped tubers, leaving a net yield of saleable potatoes 655 bushels per acre.

The loss from scab culls in this plot was surprisingly light considering the past history of the field in this respect and the fact that a large percentage of the tubers had slight scab infections in 1949. Only Katahdin, with 12.8 percent scab culls, and Cobblers with 15.5 percent, showed material losses from this cause. Sulfur at 100 lbs. per acre was mixed with the fertilizer in this field and may have influenced the outcome with scab.

N. Y. table 2. Results of the test of scab-resistant potato seedlings at the Schuler farm in 1949.

Variety	No. of replications	Total yield per acre	No. 1 size	Scab culls	Cracked & knobby	Net saleable per acre	Total scabby	Rhizoc.	Maturity
		Bu.	Pct.	Pct.	Pct.	Bu.	Pct.	Pct.	
Kennebec	1	852	98.1	2.0	20.0	655	39	11.0	6.0
Katahdin	4	643	95.9	12.8	5.3	509	90.8	48.5	5.3
Col. 6332	3	600	92.7	0.0	14.5	476	56.3	46.8	6.3
Ontario	4	521	91.3	0.0	3.5	459	32.0	23.5	8.0
Ia 116-16	2	514	93.1	0.0	7.5	443	52.0	43.5	9.0
Seneca	5	529	95.5	.6	16.6	419	74.6	26.6	7.2
B 395-5	3	454	91.0	1.3	2.5	398	72.3	14.8	7.0
Rural	4	572	89.1	3.0	26.3	364	81.3	29.5	7.3
Cobbler	3	589	89.8	15.5	19.0	362	96.5	45.3	4.0

Several varieties had cracked or knobby tubers. Rural had over 26 percent growth cracks, and was followed in order by Kennebec with 20 percent; Cobbler, 19; Seneca, 16.6; and Col. 6332, 14.5. Thus the reductions in marketable tubers were greater from misshaped tubers than from scab culls.

Test at the Dunn farm, W. Henrietta.

Tests have been continued here because in addition to a moderate infestation of the scab organisms in the soil, there is also an infestation of Fusarium solani var. Eumartii, which causes a wilt disease (Z disease) of potatoes. This disease is particularly troublesome in Rural potatoes, which was formerly the variety most commonly grown in this section.

The test in 1949 gave just about the usual results. The yields were only fair, perhaps due to the dormant condition of the seed planted which gave the plants a slow start. There was a rather high percentage of total scabby, but in most cases the spots were small without deep pits. Only Katahdin lost a seriously high percentage due to scab culls. The Rural and Kennebec were rather heavy losers from misshaped tubers.

In net saleable tubers (N. Y. table 3), Ontario heads the list with 471 bushels per acre. This variety is followed in order by Col. 6332, B 395-5, B 434-127, and Ia. 116-16. None of these had lost heavily from scab culls or misshaped tubers. The Rural fell behind due to a low percentage of No. 1 size, some scab culls, and about 19 percent misshaped tubers. Kennebec had a rather low total yield and also suffered losses from the same causes as Rural but to a lesser extent. Katahdin had a high total yield (480 bushels per acre) but lost 55 percent from scab culls.

Regarding Z disease, which was not deducted in computing the net saleable potatoes, three varieties showed up decidedly worse than the others. They were Rural with 56.8 percent; Ia 116-16, 39.5; and Kennebec, 32.0. In many areas of western New York this might be an important consideration.

N. Y. table 3. Results of the test of scab-resistant seedlings at the Dunn farm in 1949.

Variety	Total yield per acre	No. 1 size	Scab culls	Cracked & knobby	Net saleable per acre	Total scabby	Z disease	Maturity
	Bu.	Pct.	Pct.	Pct.	Bu.	Pct.	Pct.	
Ontario	525	95.4	.7	5.3	471	49.3	9.3	9.5
Col. 6332	442	86.2	0.0	10.1	343	39.3	8.8	7.2
B 395-5	395	88.0	2.0	5.8	321	69.3	6.3	9.8
B 434-127	374	92.7	8.7	2.7	308	84.3	7.3	7.0
Ia 116-16	364	92.3	1.3	8.5	304	74.5	39.5	10.0
Rural	375	81.6	7.3	19.5	228	67.0	36.8	4.
Kennebec	277	87.2	5.0	19.3	185	78.0	32.0	1.0
Katahdin	433	92.1	55.0	3.3	174	94.0	10.7	4.5
L.S.D.	190	10.5	5.4	10.3		19.2	13.0	

Specific Gravity of tuber samples.

Since starch content and cooking quality are supposed to be related to the specific gravity of tubers, samples from each of the varieties from each plot were weighed in air and in water and the specific gravity calculated. The figures obtained (N. Y. table 4) seem to be rather low, compared with previously published figures, but at least they are believed to be comparable with each other. The highest reading was obtained for Ia 116-16, which seems to be well out in front. Ontario, Rural, Col. 6332, and B 395-5 follow rather close together. Below these came Kennebec and Katahdin.

N. Y. table 4. Summary of tests of specific gravity from the different farms.

Variety	Location			
	Robson	Dunn	Schuler	Average
Ia 116-16	1.077	1.085	1.070	1.077
3908	1.069			
B 395-5	1.069	1.073	1.061	1.068
2V2452	1.069			
Ontario	1.067	1.077	1.068	1.071
B 434-127	1.066	1.069		
Kennebec	1.067	1.061	1.069	1.066
Rural	1.067	1.069	1.074	1.070
Col. 6332	1.063	1.073	1.070	1.069
Katahdin	1.062	1.063	1.064	1.063
L.S.D.	.011	.005		.0045

Summary

Only one of the three tests this year was severe as a test of scab resistance. It had been expected that the test on the peat soil at Schuler's would give a high percentage of scab culls on susceptible varieties, but although the percentage of scabby potatoes was high, only a few developed deep lesions, which were counted as scab culls. Thus, at this place only Cobbler and Katahdin lost seriously due to scab culls.

At Dunn's place only Katahdin was a heavy loser from scab culls. At Robson's only the highly scab-resistant varieties escaped heavy losses. Here Kennebec, Katahdin, B 434-127, 3908, 2V2452, and Rural lost heavily from scab culls. This leaves only Ontario, Ia 116-16, Col. 6332, and B 395-5 in the highly scab-resistant class.

Of these, the Ontario seems to be most desirable because of its high yields, scab resistance, comparative freedom from misshaped tubers, and resistance to Z disease and late blight. In cooking quality, it is fair. It was reported discolored due to pressure bruises and in some other conditions its tubers developed heat necrosis.

Iowa Seedling 116-16 has been grown in a considerable number of comparative tests. It has good scab resistance and yields well. It had tubers of the highest specific gravity of any in these tests, which should indicate good eating quality. It is very late like Ontario. Some difficulty has been experienced with seed-piece decay, so that in a number of tests poor stands have been obtained. Also, in the test at Dunn's it proved to be susceptible to Z disease though not as susceptible as Rural.

Col. 6332 is an early to mid-season potato, which has not yielded quite as well as the later varieties. It has satisfactory scab resistance and does not appear to be susceptible to Z disease. It has some misshaped tubers but usually these are not excessive. A few tubers were hollow in 1949.

B 395-5 has been tested quite extensively. It has good scab resistance, is extremely late, and yields not quite as well as Ontario on the average. It is quite resistant to Z disease and is about with Ontario in specific gravity. It has a rough skin on which soil tends to adhere, so it rarely presents a desirable clean white appearance.

In 1948, Kennebec and B 434-127 performed very well at the Dunn Farm but when planted at Robson's in 1949 both suffered heavy losses from scab culls. In addition, Kennebec showed 32 percent affected with Z disease at Dunn's in 1949 and 19 percent misshaped tubers. It also suffered from misshaped tubers on the peat soil at Schuler's but did not lose many from this cause at Robson's.

In general, it appears there are several of these scab-resistant seedlings available, which might be used, but, as yet, none of them seems to be generally superior to Ontario, although some are superior in particular respects.

NEW YORK

E. V. Hardenburg

Testing of potato varieties has been an annual project in New York for many years. So long as new varieties are named and introduced anywhere in the United States and Canada, the need for such work will continue. Since the introduction of Katahdin in 1932, over 40 varieties have been named, and most of them officially tested. It is an interesting fact that none of these has proved so widely adapted and none is so widely grown in the northeast as Katahdin. One must concede, therefore, that neither high yield nor high starch content is in itself the principal factor responsible for the popularity of a potato variety. Certainly in this area, Katahdin is seldom among the varieties of highest yield and it is almost never above average specific gravity. Apparently Katahdin is popular because of its excellent market quality; its tolerance of heat, drought, and the leaf roll disease; and its reliability under a wide range of environmental conditions and cultural practices. In spite of the merits of such varieties as Houma, Chippewa, Sebago, and Pontiac, which closely followed Katahdin, none of these has quite measured up to the allround performance of the latter.

The year 1949 was quite abnormal in nearly all parts of New York so far as weather is concerned. July and August were extremely hot and dry. In late August and early September rains caused a resumption of growth which resulted in high average yields up-State but were too late to benefit the Long Island crop. As a result, for the first time in many years, if ever, the average yield of the potato crop up-State equalled that of the crop on Long Island. Any variety that could yield well under such adverse seasonal weather must be credited with a modicum of heat and drought tolerance.

In 1949, the cooperative variety test was conducted in the counties of Allegany, Erie, Essex, Genesee, Nassau, Onondaga, Steuben, Suffolk, and Tompkins. A total of 28 named varieties was included, seed of 12 of which was furnished by the United States Department of Agriculture. This seed was grown at the Federal potato-breeding station at Presque Isle, Maine, and shipped from there to Ithaca in the spring. Seed of the other 16 varieties was assembled from a number of growers located in New York, Minnesota, North Dakota, and Wisconsin. The 9 tests were so distributed over the State as to provide information for growers on muck soil, on light soil in northern New York, in both Nassau and Suffolk Counties on Long Island, and on the more typical potato soils in central, southern, and western New York. All of these tests were planted with the same stocks of seed allocated from the Department of Vegetable Crops at Ithaca in 15-pound lots. Except for the Steuben County test, which was not replicated, these trials were planted in 4 replications, usually of 25 hills each. A planting plan was provided each county agricultural agent indicating the exact randomized arrangement within each block. To validate the use of single-row plots, the varieties were grouped according to season of maturity as early, midseason, late, and very late. The arrangement according to season is approximated in the list of varieties shown in N. Y. table 1 where the yields are summarized.

N. Y. table 1 - New York State College of Agriculture.
Potato Variety Trial - 1949
9 Counties No. 1 Bushels per acre

Varieties	Allegany	Erie	Essex	Genesee (muck)	Suffolk	Onondaga	Nassau*	Steuben*	Tompkins	Rating for all tests
Warba	373	601	324	546	86	329			135	28
LaSoda				606	151	719			236	12
LaSalle				568	155	612			148	22
Cobbler	423	657	320	541	118	531	372		147	26
Chippewa	534	623	375	577	195	686	435	811	173	17
Snowdrift					132	655	443		204	21
Chenango		539	392			733			168	25
Houma	511	713	409	448	153	748	511	653	302	13
Marygold		662		502		545			170	27
Essex	700	924	590		182	844	500	898	249	3
Green Mountain	625	1,030	545	614	152	909	550		213	5
Mohawk	481	710	441	502	165	779	572	714	193	13
Kennebec	664	966	538	613	171	962	554	903	227	5
Ashworth	525	899	444	616	274	751	552	740	297	7
Katahdin	539	719	469	701	283	677	536	755	226	8
Genesee	497	698				673	490	796	193	18
Madison	354	602	365	601	140	563		627	165	24
Teton	551	676	460	478	122	656	514	747	226	16
Erie	565	855	408	563	132	888	457	938	220	9
Pontiac (USDA)	682	958	600	635	172	854	569		234	3
Pontiac (KCL)	634	826		742		971		1,270	242	2
Dakota Chief	703	1,048		661		836		882	249	1
Russet Rural	479	652	432	457		724		403	182	23
Sebago	473	725	489	506	200	747	451	561	185	15
Russet Sebago	526	685	533	569		779	459	678	235	10
Fillmore	494	845		438		725		663	190	20
Ontario	364	667	448	345	124	719	329	683	277	19
Sequoia	434	835	640	463		836		847	220	10
*Total yield in bu./acre.										
LSD @ 5%	177	167	116	105	75	132	104		65	

Discussion of Results

In evaluating the newer varieties, comparison is made with some of the older varieties of similar season such as Warba, Cobbler, Chippewa, Houma, Green Mountain, Katahdin, Russet Rural, Sebago, and Sequoia. As a basis for comparing yields, a yield rating for all tests is given in the right-hand column of table 1. These ratings were computed by ranking each variety as to yield in each test, adding the rank numbers, and dividing the total by the number of times tested. On this basis, the 10 highest-yielding varieties in the list of 28 were Dakota Chief, Pontiac, Essex, Green Mountain, Kennebec, Ashworth, Katahdin, Erie, Russet Sebago, and Sequoia. Except for the two counties noted (Nassau and Steuben) all yields are in terms of bushels per acre of No. 1 size tubers. A further comparison of yield performance is given in terms of the number of times each variety ranked among the top 5 as shown in N. Y. table 2.

Table 2. Potato Variety Test - New York - 1949

Variety	Times Tested	No. of times among 5 highest yielding
Warba	7	0
La Soda	4	0
La Salle	4	0
Cobbler	8	0
Chippewa	9	1
Snowdrift	4	0
Chenango	4	0
Houma	9	1
Marygold	4	0
Essex	8	5
Green Mountain	8	4
Mohawk	9	1
Kennebec	9	6
Ashworth	9	4
Katahdin	9	2
Genesee	6	0
Madison	8	0
Teton	9	0
Erie	9	2
Pontiac (U.S.D.A.)	8	6
Pontiac (K.C.L.)	6	4
Dakota Chief	6	5
Russet Rural	7	0
Sebago	9	1
Russet Sebago	8	0
Fillmore	6	0
Ontario	9	1
Sequoia	7	1

As in other years, the distinctly early varieties did not yield as well as the midseason and the later ones. As usual, the early varieties yielded comparatively better on muck soil than on upland soils. It seems unfair to rate the earlier varieties on the basis of comparative yield. Rather, they should be evaluated as to their marketability, depth of eyes, and internal quality. La Soda may be an improvement over Triumph in that it has a better shape and a shallower eye. La Salle similarly yielded as well as Cobbler and produced a smoother tuber. Houma is losing popularity in New York because of its susceptibility to scab and late blight. Marygold sprouts too easily, did not yield well, has a purple eye and yellowish flesh. Essex again yielded very high and is increasing rapidly in acreage because of this and because of its marketability and blight resistance. There was some complaint this year that the tubers cracked or air-checked badly immediately after harvest. Green Mountain is losing ground because of its roughness and in spite of its high yield and good culinary quality. It is also very subject to disease, to black spot, and to internal necrosis. Mohawk should be given further trial because of its high baking qualities when grown on well-drained soil. Kennebec gave further evidence of popularity because of its yield, marketability, and blight resistance. It must be planted close to avoid oversize and rough shape, which were complaints heard often this year. Ashworth again yielded well and with its blight resistance and attractive tubers should be tried commercially by more New York growers. Katahdin gave a better yield performance than usual and demonstrated its reliability and wide adaptation. Genesee, said to be of chance seedling origin, appears to be identical to Katahdin. Although said to set tubers deeper, to sunburn less, and to be earlier than Katahdin, it did not prove to be so this year. Madison, one of Dr. Reddick's blight-resistants gave disappointing yields. However, it showed remarkable tuber uniformity and good tuber shape and appearance. Teton seems to have lost favor, as fewer acres were grown in New York in 1949. Some growers feel that it may be a carrier of ring rot, even though it is resistant to this disease. Similarly, Erie, in spite of its productivity, lost ground because of its susceptibility to internal necrosis or breakdown. Pontiac produced a very high yield and maintained good tuber shape and uniform size in spite of heat and drought. Because of its low starch content and red color, Pontiac has a very limited outlet. Dakota Chief was first in yield rating but is almost identical with Pontiac. It will sell in such cities as Binghamton and Elmira, and could be grown for seed for south Florida. Russet Rural should not be grown except for potato chips where it is still preferred over all other varieties. Sebago, still popular with some growers, may be losing ground because of its poor storage quality and tendency to develop Fusarium dry rot in storage. Russet Sebago yielded well and has scab resistance, but it seems otherwise about the same as Sebago. Fillmore, Ontario, and Sequoia are very late. Fillmore has a faint pink blush on the tubers and did not yield well. It is blight-resistant. Ontario gave variable results, but in several cases produced sprout tubers and was stoloniferous as a result of heat and drought. It is very scab-resistant and highly marketable when grown under normal conditions.

Plans for 1950

We plan to run about eight cooperative tests in 1950. Some of the older varieties will be dropped. However, we shall include Cobbler, Green Mountain, and Katahdin for comparison with the new introductions. We urge that seed of such new varieties as Canus, Yampa, Progress, Canoga, Setapa, Waseca, Chisago, La Salle, DeSoto, and La Soda be provided for test in New York next year. At least 12 pounds of seed of each is required for our replicated tests. We also should like to include a few of the most promising unnamed seedlings which are likely to be named in the near future

NEW YORK

J. R. Livermore

The extreme heat and drought of the 1949 growing season were useful, although for a time it looked as if potato yields would be reduced. Leaf hoppers and tarnished plant bugs thrived in the weather; consequently, there were marked differences between the resistant and susceptible types. Many of the seedlings with Solanum chacoense germplasm in their pedigree maintained bright green luxuriant foliage throughout the summer. The bulk of these seedlings are quite resistant to leaf hopper and tarnished plant bug. The most resistant sorts tend to be a bit late and produce small tubers, but this year we harvested a few resistant seedlings that were midseason maturity with fairly good potatoes under them. In many instances susceptible sorts, only 3 feet away, were badly damaged by the insects. Continued backcrossing by commercial types should eventually produce the desired combination of insect resistance and commercial tubers.

The leaf roll resistance phase of the project is being actively prosecuted. One of my seedlings, numbered 2V2452, has proved quite field-resistant to leaf roll. It is not immune, and it will come down with leaf roll if viruliferous insects are caged on it. However, under field conditions, even with sizeable populations of aphis and plenty of leaf roll in the surrounding rows, the 2452 hardly ever shows a leaf roll plant. This seedling is out of a cross between Albion and Katahdin made at Gabriels in 1938; a seedling from that cross was pollinated by Katahdin again in 1940, and one of the seedlings from the second cross is 2V2452. It is a good yielder, the tuber has white skin, white flesh, good cooking quality and holds its shape well; even in this unusual season there were no growth cracks nor misshapen tubers. It will be named Canoga, the name of a small village on the west shore of Cayuga Lake near which Isaac P. Roberts, the first dean of the New York State College of Agriculture, was born.

The vitamin C project is moving along slowly. It is a very time-consuming activity. Any new hybrid seed usually rests for several months, then it is grown in the greenhouse the first year after the cross was made. The second year there is a single hill in the field. The third year we grow a short row which usually produces enough potatoes to furnish an adequate sample for the determination of ascorbic acid content. From the standpoint of human nutrition the important figure is the late winter content. This cannot be determined until February, which makes it too late for greenhouse planting that year, so another year goes by before any high-content strains can be hybridized. Any desired recombinations are still dependent upon viable pollen, cross-compatibility, and so on. Just to make it more interesting, the high ascorbic acid content must be combined with high yield, good quality, and all the other characters essential to a good variety.

If any potato researcher is in need of a new digger by all means he should buy a flat-bed digger. Perhaps everyone already has such a machine. In any event, we used one last fall and the result was the easiest, cleanest job of harvesting in which I have ever taken part. We plant

our short experimental rows with 5-foot breaks between every two sections in the long field row. With the old type digger nearly always we had to stop at the break to clear the machine to maintain separation between lots. Using the flat-bed we dug the whole length of the field without a stop, the tubers falling back on the ground barely 6 inches forward of where they grew. Our machine was a 26-inch wide, single-row, power takeoff, level-bed, with front truck, manufactured by John Deere and Company at Syracuse; no doubt other companies have similar machines that would perform equally well.

In addition to leaf roll and insect resistance in the new seedlings, we are continually looking for higher yield and better quality. Any seedling that might be introduced because of some outstanding attribute must also be a good yielder and have reasonably good eating quality. It is not at all necessary that every variety shall be as mealy or mealier than the best Green Mountain or Russet Burbank one ever ate. All the consumer surveys seem to agree that only a very small percentage of potatoes are baked anyway, so why worry about mealiness when baked? No, a desirable market potato should be attractive to the eye, should not slough off while boiling, must stay white after cooking, and be somewhere between mealy and soggy in texture or should we state it simply as not soggy. Whenever any high-yielding, resistant seedling of mine satisfies those four requirements I shall be glad to introduce it to the trade. The Katahdin variety is an excellent case in point.

The unusual season of 1949 served to emphasize the need of a potato that will maintain its shape. At Ithaca the extremely hot dry weather was followed by cool, rainy days and nights in late August, September, and October; but the first killing frost did not arrive until late in October. Consequently, many varieties developed tubers that were entirely out of grade. Any variety maturing the least bit late really suffered. In one of the newer varieties, for instance, over 90 percent of the potatoes was overlarge, or covered with deep growth cracks, or were dumbbell-shaped, or joined at an angle; a high yield in pounds total but very few U.S. #1. Other varieties and seedlings were nearly as bad. The Katahdin came through with flying colors, all U.S. #1 except that some, of course, were large; but no growth cracks, knobs or second growth.

We used to be concerned about early-maturing vines; the grower wanted early varieties. What happened this year? At Ithaca the real early varieties were hardly worth digging. The crop was very light because there was almost no rain from the time they were planted until the vines had died in the drought. We have a seedling that is nearly a week earlier than Earlaine. The past few years it has shown high yields for an extra early but in 1949 we got little more than our seed back. As a matter of fact, we were going to name this early seedling next year and distribute it. Well, should we do so? With normal rainfall or irrigation it ought to be a good early, but with a dry season it is worthless.

With vine-killing practices becoming ever more popular, what the potato grower wants is not necessarily an early-maturing vine, which is usually

coupled with a smaller yield, but rather a variety that will grow tubers rapidly and continually from the time they are set until the vines are killed either by artificial means or by frost. In that way the grower will get satisfactory yields every year, and yet he can spread the harvest over a long period and begin digging when he will.

As irrigation becomes more widely used it too should be considered in the breeding program. In fact, our breeding program may need a bit of reorganization to keep up with the times. At the outset we were charged with the task of developing an early variety, with shallow-eyed tubers which would cook mealy. Now it would seem that the market demands a potato with eye-appeal, which will not slough off while boiling, and will stay white after cooking. In addition, the grower wants a variety that will grow tubers continually under the protection of DDT until such time as he chooses to kill the vine and one that will make maximum use of such irrigation water as he may be able to provide.

Each year we grow about 10,000 new seedlings from our crosses made in the greenhouse, and there are around a thousand to fifteen hundred old ones in the various row tests for yield, quality, and other studies.

NEW YORK

D. Reddick and L. C. Peterson

Drought Tolerance

The season of 1949 was most favorable at Ithaca for the separation of stock possessing a tolerance for drought. Some lines died without issue while a few others not only survived the prolonged drought but produced a satisfactory crop. Contrary to previous opinion the variety Essex withstood the dry weather much better than had been anticipated.

Blight

All breeding stock was classified as to reaction to races B, C, D, and the combination race BD of Phytophthora infestans. All new crosses were made in such a way as to yield a progeny some individuals of which would possess immunity to all known races of the parasite. Over 500 new crosses were made, and a preliminary sampling indicates that the objective was attained. From this material it should be possible to determine whether additional races of the parasite can be developed. It seems of some significance that all cultures thus far picked up in the field on blighting hybrids have been reduced to some one of three basic races and to one combination race. The basic races have been designated B, C, and D. The combination race found is BD. It is confidently anticipated that combinations BC, CD and BCD can be synthesized and that these will be found ultimately in nature. The foregoing work has been done in close cooperation with Dr. W. R. Mills of Pennsylvania State College.

Scab

The scab nursery was further conditioned by the addition of a considerable amount of organic matter in the form of chicken manure, a substance reputed to be highly favorable for the development of scab. No scab appeared on any of the varieties whether susceptible or not. The same area gave most satisfactory results in 1948.

Virus

No aphid of any kind was found at any time during the season in either the leafroll or rugose mosaic exposure plots. Tarnished plant bugs were abundant at one time but it is not anticipated that any spread can be demonstrated. In a few instances, plants were found in the rugose plot which appeared to exhibit current-season infection.

Black Spot

In recent years there has appeared in various parts of New York, but in particular Long Island, a condition of stored tubers commonly referred to as black spot. This trouble has become so serious on parts of the Island that a concerted effort has been instituted to determine, if possible, the cause and, of course, some preventive measure. The spot consists of a blacking of tissue under the skin, apparently induced by bruising, scarcely discernible until the tuber is peeled. Marked variation in the

amount of injury has been observed depending on variety, and on the strength of this a series of tests were instituted at Ithaca and two places on the Island to determine, if possible, how great this difference in varietal tolerance may be and also to find out whether this character is heritable. The work on black spot is done in cooperation with Dr. F. J. Stevenson.

Unfortunately, excessively dry weather interfered with the experiments to the extent that in some cases no material was produced for a test of any sort. Material has been solicited from various sources for the continuation of the work in 1950.

Correll's Mexican Collection

True seeds of the Correll collection have been grown and inoculated variously. Collections of tubers only have not been received as yet.

1. Roughly, half of the collections are plants that are immune to P. infestans. Several collections of the demissum group are susceptible.

2. All plants are susceptible to virus X.

3. All plants are susceptible to virus Y, but a very few seem to react by local lesion only. A few require further study to determine whether the virus becomes systemic without symptoms. If infection is strictly by local lesion such plants might be useful in a breeding program.

4. Ten plants of each lot were turned over to Dr. Hugh C. Kirkpatrick and John Natti for leafroll tests. Most of the plants reacted positively by aphid vector (Myzus persicae). Six lots, identified tentatively as S. neoantipoviczii, did not contract the disease. The aphids died. This could not have been mere coincidence. Tests with other vectors and graft inoculations are indicated. Some lots showed a reduced number of infections; 1, 2, or 3 of the 10 reacted. Such cases are to be investigated further because of wild stocks could be in heterozygous condition for leafroll resistance. In the case of S. polyadenium 3 of 10 plants contracted leafroll in one instance, and neither of 2 plants contracted it in another. The aphids usually died. Neither of 2 plants of S. cardiophyllum contracted leafroll. This is a triploid which does not set seeds in the wilds of Guatemala (fide A. S. Muller) or by selfing at Ithaca.

NORTH CAROLINA

Fred D. Cochran and Daniel T. Pope

The 1949 breeding program in North Carolina has been conducted along lines similar to those of previous years. The scope of the work has been somewhat more comprehensive than that in the past. Particular emphasis is placed on varietal improvement by attempting to combine smoothness, yield, earliness, and quality, and to develop resistance to southern bacterial wilt. The search for a satisfactory source of resistance through the testing of varieties, seedlings, and introductions to determine their reaction to southern bacterial wilt is conducted as a joint program between the Departments of Plant Pathology and Horticulture. The nature and description of this work is covered in a separate report.

In eastern North Carolina, performance and evaluation tests on new varieties and seedling selections were conducted at Camden and Plymouth. In western North Carolina, breeding and foundation stocks were maintained and increased in the mountain region near Jefferson.

Eastern North Carolina - At Camden, semi-commercial tests were conducted on 6 varieties (N. C. table 1). In addition, 9 other varieties were placed in replicated tests and compared with the standard variety Irish Cobbler (N. C. table 2.) At Plymouth, 18 varieties, as well as different sources of seed of these varieties, were compared in replicated tests (N. C. table 3). Also, 31 advanced lines were placed in replicated tests with Irish Cobbler, White Warba, and 3 of the more promising new varieties (N. C. table 4). Observational tests were run on 40 lines placed in 25-hill units. More than 200 selections from 21 family lines of 1948 U.S.D.A. seedlings were evaluated in 5-hill units.

N. C. table 1 - Semi-commercial tests on six Irish potato varieties - 1949
H. C. Forebee Farm - Camden, N. C.

Planting date: March 9, 1949
Harvesting date: July 6, 1949
Days from planting to harvest: 119

Variety	Yield per acre
	Bu.
Essex	573.6
Chenango	487.0
Snowdrift	453.2
Cobbler	234.5
Katahdin	228.3
Sebago	150.0

N. C. table 2 - Irish potato variety trials at Camden, N. C. - 1949

H. C. Forebee Farm

Planting date: March 9, 1949
Harvesting date: July 6, 1949
Days from planting to harvest: 119

Variety or Number	Yield per acre
	Bu.
Ashworth	560
B 61-3	421
Placid	418
LaSalle	392
Kennebec	372
Virgil	367
White Cloud (Nebr.2)	353
Fillmore	277
Empire	265
Irish Cobbler	259

Yield difference required for significance
at 5% level - 59 bushels
at 1% level - 79 bushels

N. C. table 3 - Irish potato variety trials at Plymouth, N. C. - 1949

Tidewater Experiment Station

Planting date: March 17, 1949
Harvesting date: July 12, 1949
Days from planting to harvest: 117

Variety	Yield per acre	Specific Gravity
	Bu.	
Essex (N.C.)*	423	1.0568
Essex (N.Y.)	409	1.0562
Kennebec (N.C.)	336	1.0627
Placid (N.C.)	331	1.0538
Cobbler (P.E.I.)	293	1.0605
Sebago (N.C.)	283	1.0559
Marygold (Me.)	277	1.0602
Chenango (N.Y.)	275	1.0543
Chenango (N.C.)	273	1.0649
Snowdrift (N.Y.)	263	1.0640
Katahdin (Me.)	263	1.0627
Ashworth (N.Y.)	262	1.0543
Kennebec (B.P.I.)	261	1.0554
Fillmore (N.C.)	257	1.0632
Katahdin (N.C.)	256	1.0540
Snowdrift (N.C.)	255	1.0556
Bliss Triumph (N.C.)	241	1.0532
Cobbler (N.C.)	236	1.0549

Contin. N. C. table 3 - Irish potato variety trials at Plymouth, N.C. - 1949

Variety	Yield per acre	Specific Gravity
	Bu.	
Virgil (N.C.)	235	1.0614
B 61-3 (B.P.I.)	232	1.0625
LaSalle (N.C.)	215	1.0612
Nebraska 2 (N.C.)	204	1.0554
Sebago (Me.)	203	1.0554
Bliss Triumph (Minn.)	191	1.0452
Empire (N.C.)	187	1.0636

Yield difference required for significance
at 5% level - 77 bushels
at 1% level -103 bushels
*Indicates source of seed.

N. C. table 4 - Yield tests of advanced seedling selections of Irish potatoes

Plymouth, N. C. - 1949

Tidewater Experiment Station

Planting date: March 17, 1949
Harvesting date: July 13, 1949
Days from planting to harvest: 118

Variety or Number	Yield per acre	Specific Gravity
	Bu.	
Essex	370	1.0568
142.9-19	356	1.0624
B 73-10	334	1.0546
B 888-1	314	1.0528
B 880-4	303	1.0639
B 922-4	300	1.0593
Cobbler	300	1.0605
B 913-2	296	1.0529
B 925-4	289	1.0582
Snowdrift	288	1.0554
B 854-6	287	1.0544
White Warba	285	1.0593
B 793-16	283	1.0624
B 914-5	279	1.0627
B 854-7	275	1.0505
B 906-2	269	1.0684
B 889-2	264	1.0609
B 789-3	262	1.0570
Chenango	260	1.0502
B 789-8	258	1.0616
96-56	252	1.0625
3531	251	1.0590

Contin. N. C. table 4 - Yield tests of advanced seedling selections of Irish potatoes.

Variety or Number	Yield per acre	Specific Gravity
	Bu.	
B 61-3	249	1.0560
B 789-9	248	1.0591
B 854-10	243	1.0599
B 914-6	237	1.0560
B 916-3	236	1.0610
2809	235	1.0626
B 880-6	229	1.0681
B 919-1	229	1.0543
B 927-5	228	1.0627
B 914-4	219	1.0670
B 913-1	215	1.0543
Nebraska 2	212	
142-1-2	175	1.0505
B 854-9	71	1.0598

Yield difference required for significance
at 5% level - 63 bushels
at 1% level - 84 bushels

At Camden, the performance of many of the new late-blight-resistant varieties far exceeded that of Irish Cobbler. This was particularly true of Essex, Ashworth, Chenango, Snowdrift. At Plymouth, heavy rains prior to harvest caused rots in many of the varieties and advanced lines which brought about a wide variability in yields within and between replications.

Western North Carolina - From 33 family lines received from the U.S.D.A., 4,117 seedlings were grown in isolated plots near Jefferson, N. C. From these seedlings 186 selections were made (N. C. table 5). Each of these

N. C. table 5 - Seedling selections at Jefferson, N. C. in 1949

Pedigree	Parentage	Seedlings	Selected
B 1241	B 281-81 (N.C. 2948) selfed	142	0
B 1242	B 434-57 (N.C. 3460) selfed	89	0
B 1243	B 434-141 (N.C. 3544) selfed	63	0
B 2383	B 759-64 x B 606-3	70	1
B 2384	B 778-15 x B 582-33	110	2
B 2385	B 779-1 x B 582-33	68	0
B 2386	Furore x B 446-58	45	0
B 2387	Friso x Flava	34	0
B 2389	Teton x B 446-58	24	0
B 2390	B 607-37 x B 607-56	53	1
B 2391	B 607-56 x B 355-24	139	6
B 2392	B 607-56 x B 402-1	165	6
B 2393	B 607-56 x B 446-58	90	2
B 2394	B 607-72 x B 355-24	186	0

Contin. N. C. table 5 - Seedling selections at Jefferson, N. C. in 1949

Pedigree	Parentage	Seedlings	Selected
B 2399	Kennebec x B 445-41	93	3
B 2403	B 275-77 (N.C.2777) x B 355-24	134	23
B 2404	B 275-77 (N.C.2777) x B 446-58	86	13
B 2405	B 275-77 (N.C.2777) x B 281-81 (N.C.2948)	177	4
B 2406	B 275-77 (N.C.2777) x B 434-57 (N.C.3640)	92	3
B 2407	B 275-166 (N.C.2866)x B 281-81 (N.C.2948)	221	8
B 2408	B 275-166 (N.C.2866)x B 434-57 (N.C.3460)	89	1
B 2409	B 281-81 (N.C.2948) x B 355-24	261	8
B 2410	B 281-81 (N.C.2948) x B 607-56	175	8
B 2411	B 281-81 (N.C.2948) x B 434-57 (N.C.3460)	226	6
B 2412	B 434-57 (N.C.3460) x B 355-24	92	13
B 2413	B 434-57 (N.C.3460) x 607-56	96	14
B 2414	B 434-141(N.C.3544) x B 355-24	193	6
B 2415	B 434-141(N.C.3544) x B 434-57 (N.C.3460)	271	11
B 2416	B 301-89 (N.C.3828) x B 446-58	163	9
B 2417	B 301-89 (N.C.3828) x B 437-57 (N.C.3460)	236	15
B 2441	Ackersegen x Flava	162	11
B 2442	Calrose x Flava	21	4
B 2446	Katahdin x Flava	51	8
		4117	186

seedling selections will be divided and observational plantings will be grown in the eastern part of the State while increase plantings will be made in the mountains.

For increase and observation, 263 selections were grown in 10-hill units and 156 lines were grown in 20-hill units. In addition, 20 of the more promising advanced lines and a number of the newer varieties were increased on a larger scale. Also, materials tested for wilt resistance in eastern North Carolina were duplicated in this area.

Raleigh - Approximately 7,200 seedlings were grown and harvested in the greenhouse during the fall and early winter. Most of these seedlings will be tested in 1950 in the eastern part of the State for their reaction to southern bacterial wilt. All will be increased in the mountains and evaluated for horticultural characteristics when a sufficient amount of seed is obtained.

NORTH CAROLINA

L. W. Nielsen

Evaluation for Southern Bacterial Wilt Resistance

Family lines and selections were planted on wilt-infested soil March 29 and 30, 1949. The selections were replicated 3 times in 10-hill plots, and for the family lines a single hill was planted for each seedling. Disease readings were made July 5, 6, and 7. At this time many selections and family lines having earliness were dead and the tubers decayed. Consequently, satisfactory disease readings were not obtained for all the material planted. Disease readings from the 3 replications of 29 selections were obtained. These data are summarized in N. C. table 6.

N. C. table 6. The wilt resistance performance of 29 selections that have had little disease in the past 2 years. Three replications of 10-hill plots were planted March 29 and 30, 1949. Disease readings made July 5, 1949.

Selection No.	Average number of diseased hills per plot
B 69-12	1.7
B 73-18	4.7
B 91-3	4.0
B 733-5	6.0
B 777-5	2.7
B 793-6	5.3
B 793-10	6.3
B 793-14	3.7
B 793-16	4.3
B 880-3	6.3
638	1.7
2767	2.7
2777	1.3
2779	3.3
2808	1.0
2840	.7
2841	3.3
2866	2.3
2878	1.3
2959	4.3
2983	.7
2985	.3
3066	3.3
3165	3.0
3770	2.0
4468	4.7
142.9-19	2.7
142.10-9	.7
142.16-7	3.7
L. S. D. 5%	3.8

There was considerable variation in the disease readings from replication to replication, but the statistical analysis indicates a difference in resistance between the several selections to southern bacterial wilt.

Disease readings were also made from surviving seedlings of 15 family lines. These data are presented in N. C. table 7.

Some family lines had a larger proportion of their seedlings diseased than others. This may be due, in part, to differences in resistance, but in many cases the seedlings had died and the tubers decayed following heavy rains, and wilt readings were not obtained. Those seedlings that escaped wilt in 1949 will be planted again in 1950.

N. C. table 7. Wilt resistance performance of 15 family lines. One hill of each seedling was planted March 29 and 30, 1949. Disease readings were made July 5, 1949.

Family No.	Parentage	Planted	With wilt	With wilt
		No.	No.	Pct.
B 2074	Empire x B 445-41	68	41	60.3
B 2076	Eric x B 61-3	92	49	53.2
B 2099	Mohawk x B 445-41	267	127	47.5
B 2117	Sebago x B 355-44	168	108	64.2
B 2123	Teton x B 355-44	169	94	55.6
B 2124	Teton x B 445-41	193	110	56.9
B 2153	B 355-24 x B 355-44	97	61	62.8
B 2157	B 355-44 x B 351-44	45	24	53.3
B 2167	B 446-54 x B 401-3	208	95	45.6
B 2170	528-170 x B 522-33	60	29	48.3
B 2172	B 594-46 x B 355-44	27	12	44.4
B 2176	750-10 x B 522-33	43	12	27.9
B 2178	792-88 x B 351-44	22	17	77.2
B 2182	792-94 x B 355-44	93	34	36.5
B 2183	792-94 x B 445-41	12	6	50.0
Totals		1564	819	52.4

North Dakota (Mandan)

W. P. Baird and Gene S. Howard

Twenty-five varieties of potatoes were grown in one test at the Northern Great Plains Field Station, and each was replicated 5 times in randomized blocks. The results of this test are shown in North Dakota table 1. A severe hailstor

North Dakota Table 1. - Potato variety tests at the Northern Great Plains Field Station, Mandan. Planted May 6 and harvested September 29, 1949.

Variety	Average yield U. S. #1 per acre	Percent #1 compared with total
	Bu.	
Sebago	173	85
Warba	152	76
Earlaine 2	147	64
Red Warba	143	69
B 70-5 (Kennebec)	129	76
Irish Cobbler	129	68
Earlaine	128	60
46952	127	67
Katahdin	121	77
Sequoia	118	76
Chippewa	116	69
Teton	114	66
Mohawk	112	90
Pontiac	111	75
Triumph	107	72
Pawnee	106	57
Green Mt.	100	51
Kasota	87	62
Norkota	85	50
Rural New Yorker	84	66
Mesaba	82	52
Erie	69	52
Houma	65	47
White Rose	64	51
Russet Rural	62	49

Least significant difference at 5-percent level - 34.3 bushels.
Least significant difference at 1-percent level - 45.4 bushels.

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in the late afternoon of 7/26/49 caused considerable damage to the potato plant foliage, resulting in much regrowth among the later varieties in both the vines and the tubers. The first fall killing frost occurred during the night of September 13.

In another potato test, 13 varieties obtained from the North Dakota Agricultur College were grown in two replications, each randomized. Data for this test are given in North Dakota table 2.

North Dakota table 2. - Potato variety test of North Dakota Agricultural College potatoes at the Northern Great Plains Field Station, Mandan. Planted May 11 and harvested September 27, 1949.

Variety	Average yield #1 per acre	Percent #1 compared with total
	Bu.	
Satapa	138	69
La Soda	134	82
Waseca	114	89
Irish Cobbler	108	74
Cayuga	104	63
Essex	102	76
Kennebec	90	79
530	82	72
Red Pontiac	75	73
148.84	71	69
Triumph	69	68
626	62	81
Progress	17	15

Least significant difference at 5-percent level - 44.2 bushels.
Least significant difference at 1-percent level - 61.9 bushels.

NORTH DAKOTA

Wm. G. Hoyman and Harold Mattson

Twelve selections from the U. S. Department of Agriculture, 5 from the N. Dak. Agricultural Experiment Station, and the varieties Cobbler, La Sodak and Progress were tested in the scab nursery at Fargo during 1949. The russet selection B 515-2 was the only one remaining free of scab. It had a very slight amount of skin checking on one tuber, and it is possible this could have been a trace of type 1. B 515-2 was grown at two other locations in the Red River Valley where scab was a problem on Bliss Triumph and Pontiac but showed no indications of being susceptible to strains of the scab organism present in these soils. The U. S. D. A. selections X96-56, a parent of B 515-2, B 137-5, B 637-14, B 738-8 and B 762-1 had scab readings of type 2 or less. The results in table 1 show that the North Dakota selections and the varieties had readings of type 3 or more.

N. Dak. table 1. Scab readings of selections and varieties grown in the scab nursery at Fargo, N. Dak., in 1949.

U. S. D. A. Selection or variety	Amount and type of scab	North Dakota Selection or variety	Amount and type of scab
B 73-16	1-3.0	457-1	1-3.0
B 73-18	2-4.0	513-5	2-3.0
B 76-23	2-2.5	841-3R	1-3.0
X 96-56	1-2.0	842-10	2-3.0
B 137-5	1-2.0	1084-2	1-3.5
X 157-9	1-1.5		
B 515-2	None	Varieties	
B 607-107	1-3.0		
B 637-14	1-1.5	Cobbler	2-3.0
B 738-8	1-1.0	La Sodak	1-3.0
B 762-1	2-2.0	Progress	1-3.0
B 779-8	1-2.5		

Wm. G. Hoyman

In order that North Dakota foundation seed potato growers may obtain virus-free stock, new and certain old varieties are being maintained free of latent mosaic and other viruses. Since the winter of 1946, several hundred Cobbler, Bliss Triumph, and White Rose potatoes have been indexed on Gomphrena globosa in an effort to find tubers free of latent mosaic. To date, not a single tuber has been found among these three old varieties.

Virus-free Red Warba, Pontiac, Kennebec, and Red Pontiac are now being increased. The Kennebec variety has been distributed to eight growers, and the acreage under contract with the North Dakota Agricultural Experiment Station in 1949 was a little under 2 acres.

NORTH DAKOTA

Wm. G. Hoyman

During September 1947, 107 seedlings and selections, and 12 new varieties were obtained from the U. S. Department of Agriculture Station at Presque Isle, Maine. These were grown at Grand Forks, N. Dak., in 1948 and 6 selections and 1 variety (Kennebec) were saved for further testing in 1949. The 1949 planting was at Northwood, N. Dak., and included B 137-5, B 515-2, B 607-107, B 738-8, B 762-1 and B 779-8. Kennebec was also included in the trial, as well as 2 from Canada designated as F 391 and F431.

Only B 515-2 and Kennebec were saved when the above stock was harvested in September 1949. The former is a russet that looks very similar to Russet Burbank with respect to russeting. It also has the long shape characteristic of Russet Burbank, one of its parents. Limited cooking tests have indicated that it is a desirable baker but more tests are needed before sufficient information is available regarding its quality. B 515-2 was grown in the Fargo scab nursery this year and at two other locations in the Red River Valley. It has remained free of scab and may be highly resistant because the soil at each of the three locations produced considerable scab on Cobbler, Bliss Triumph, and Pontiac. This new selection is not resistant to virus Y. It matured at the same time as Red Warba so may be classed as early or medium in that respect. It wasn't dusted or sprayed with a fungicide, and since it is susceptible to early blight the vines probably matured somewhat earlier than if they had been protected. At harvest it was noticed that there were very few small tubers. The yield was 2.19 pounds per hill as compared with 2.36 for Red Warba and 4.13 for Red Pontiac. Specific gravities taken on B 515-2, Pontiac, and Bliss Triumph were 1.0705, 1.0605 and 1.0736, respectively.

The new variety Kennebec has been grown at several locations in the Red River Valley since 1947, and some preliminary observations have been made regarding its performance. There are indications that it is more resistant to drought than Bliss Triumph or Cobbler. It is a vigorous grower and has not been affected much with early blight. Kennebec is susceptible to virus Y, but the amount of field infection has been considerably less than what occurred in Bliss Triumph, Cobbler, or Pontiac. Mild mosaic has never been observed in any plantings in North Dakota. Although Kennebec has never been included in a randomized yield test, its performance indicates that it produces favorable yields.

The fact that this new variety is susceptible to scab may be a limiting factor in its production in the Red River Valley. When grown in plots with Bliss Triumph, Cobbler, and Pontiac, it has had less scab than any one of these scab-susceptible varieties. With respect to bruising, it appears to be no worse than the above varieties. It is susceptible to Fusarium dry rot.

Approximately 250 new seedlings were obtained from Dr. F. J. Stevenson during the harvesting of the seedlings at Chapman Farm, Maine, in September 1949. Stock was selected having resistance to one or more diseases. The diseases included late blight, scab, virus X, mild mosaic, and virus Y. This new material will be tested in North Dakota in 1950, and Mr. Harold Mattson will select from it for his breeding program. The following list shows the pedigree numbers and parentage of the acquired stock:

Pedigree Number	Parentage	Pedigree Number	Parentage
B 294-29	Houma x X 96-56	B 1172-14	Chippewa selfed
B 313-21	Sequoia x X 96-56	B 1172-34	" "
B 515-2	Russet Burbank x X96-56	B 2067-4	Chippewa x B 381-2
B 524-53	1241-62 x 792-76	B 2067-10	" "
B 606-37	41956 x X 96-56	B 2067-52	" "
B 637-14	Green Mtn. x Teton	B 2067-96	" "
B 725-8	336-184 x Teton	B 2067-129	" "
B 922-3	TI-5 x B 355-24	B 2068-23	Chippewa x B 522-33
B 924-2	46952 x B 355-24	B 2069-1	Chippewa x 528-170
B 924-13	" x "	B 2069-57	" "
B 961-20	Menominee x B 61-3	B 2069-74	" "
B 991-13	B 355-24 x B 81-40	B 2069-75	" "
B 2073-6	Empire x X 157-9	B 2337	B 381-2 x B 594-46
B 2073-11	" "	B 2338	B 402-1 x B 38-16
B 2098-36	Mohawk x B 355-24	B 2346	X 528-170 x B 76-23
B 2100-7	Ontario x B 61-3	B 2347	X 528-170 x X 157-9
B 2102-8	Ontario x B 381-2	B 2348	B 580-20 x B 381-2
B 2102-11	" "	B 2350	McKellars seedling x B 35-3
B 2118-6	Sebago x B 401-3	B 2368	Pontiac x B 400-1
B 2118-63	" "	B 2369	B 381-1 x B 56-1
B 2130-1	B 56-1 x B 580-20	B 2370	B 381-1 x B 400-1
B 2140-15	B 76-43 x B 61-3	B 2372	B 400-1 x B 56-1
B 2162-18	B 381-2 x 528-170	B 2383	B 759-64 x B 606-3
B 2162-28	B 381-2 x X 528-170	B 2390	B 607-37 x B 607-56
B 2173-22	B 605-10 x X 157-9	B 2391	B 607-56 x B 355-24
B 2323	Cayuga x B 61-3	B 2392	B 607-56 x B 402-1
B 2324	Hindenburg x Katahdin	B 2395	B 607-72 x B 606-3
B 2325	Hindenburg x B 594-46	B 2396	B 607-72 x B 607-56
B 2327	Ultimus x B 400-1	B 2398	Hindenburg x B 351-44
B 2328	B 44-14 x B 61-3	B 2399	Kennebec x B 445-41
B 2329	B 56-9 x B 381-2	B 2425	B 478-1 x B 607-56
B 2330	B 56-11 x B 56-1	B 2427	Chippewa x Katahdin
B 2331	B 56-11 x B 381-2	B 2428	Chippewa x B 61-3
B 2332	B 56-11 x B 400-1	B 2429	Chippewa x X 157-9
B 2333	B 61-3 x B 402-1	B 2432	X 157-9 x 792-133
B 2334	B 76-23 x X 157-9	B 2433	X 157-9 x B 778-14
B 2335	B 76-23 x B 445-41	B 2434	B 607-72 x B 778-14
B 2336	B 76-23 x B 594-46	B 2435	B 778-14 x B 61-3
		B 2440	B 779-1 x B 61-3

NORTH DAKOTA

Harold Mattson

Three Station potato selections and 5 white and 5 red tuber potato varieties were grown in adaptability and yield trials with cooperators in 12 locations in North Dakota in 1949.

Yield data of these trials are reported in North Dakota Mattson table 1.

North Dakota Mattson table 1. Yield in bushels per acre of named and numbered varieties of potatoes tested in various locations in North Dakota in 1949.

Variety	Four dryland trials: Dickinson, Edgeley, Hettinger, Mandan	Three Trials: Grand Forks(2) & Fargo	Four Northern Trials: Grafton, Williston, Minot, Langdon irrigation				Ave. four northern trials
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
White:							
Essex	90	256	589	488	282	155	379
Cobbler	94	284	578	387	266	153	346
ND 148-84	80	234	439	589	157	153	346
Kennebec	83	349	413	509	230	173	331
ND 530	86	302	512	477	157	150	324
Cayuga	85	295	368	308	151	114	245
Red:							
Satapa	105	312	575	618	195	144	383
Red Pontiac	89	278	519	457	250	170	379
LaSoda	101	264	541	425	157	148	318
Progress	79	236	463	388	184	129	291
Triumph	80	249	460	320	209	154	286
Waseca	77	266	404	357	129	133	256
ND 626	43	195	270	167	71	68	144
L.S.D. 5%	27	---	117	223	86	42	124
Average	84	270	472	422	188	142	307

Average yields of four dryland trials at Dickinson, Edgeley, Hettinger, and Mandan are quite low. Two trials at the Potato Research Farm of the Red River Valley Potato Growers Association at Grand Forks and a trial at Fargo produced good yields with differences which were not statistically significant. These three trials suffered considerable current-season infection by potato virus Y. Yields of trials at Grafton, Langdon, Minot, and under irrigation at Williston are listed, together with the average yield of the trials, at these four northern locations.

Data of maturity, average tuber weight, specific gravity and corresponding

starch content are reported in North Dakota Mattson table 2.

North Dakota Mattson table 2. Maturity, tuber weight, specific gravity, and starch content of trial potatoes, 1949.

Varieties	Foliage green Park River 9/23	Average weight all tubers 11 trials[1]	Average specific gravity 13 trials[2]	Starch[3]
	Pct.	Oz.		Pct.
White:				
Cayuga	80	3.2	1.097	17.2
ND 530	0	4.4	1.090	15.8
Cobbler	0	4.1	1.089	15.6
Kennebec	95	5.3	1.083	14.4
ND 148-84	40	3.2	1.083	14.4
Essex	60	3.7	1.077	13.2
Red:				
Progress	10	2.4	1.081	14.0
Satapa	50	4.3	1.081	14.0
ND 626	5	4.1	1.081	14.0
LaSoda	5	4.9	1.080	13.8
Wasecа	0	4.1	1.077	13.2
Triumph	0	3.9	1.076	13.0
Red Pontiac	70	4.8	1.072	12.2
Average		4.0	1.082	14.2
L.S.D. 5%			.004	0.8

1/ Trials at Dickinson, Edgeley, Fargo, Grafton, Grand Forks (2), Hettinger, Langdon, Mandan, Minot, and under irrigation at Williston.

2/ Trials at above locations and at Cavalier and Park River.

3/ Values from von Scheele's determination.

Potato Virus Y

Current-season infection of potato virus Y was noted in the trials at Grand Forks and in the trial at Fargo where it was abundant. On July 19, current-season symptoms (vein-banding necrosis) were noted at Fargo in Cobbler (50%), Wasecа (53%), Progress and Triumph (58%), LaSoda (61%), ND 148-84 (67%), Red Pontiac (75%), Kennebec (6%), and Satapa (4%) but not in Cayuga, ND 530, and ND 626.

Almost all plants early in September showed necrotic flecks on some leaves, except ND 530 and ND 626, which were entirely free of necrotic lesions. All Cayuga plants showed tipburn late in the season but showed no vein banding necrosis. Kennebec showed 9% necrotic plants in September, and the remain-

ing plants had only minute non-veinal necrotic flecks, which may not have been due to virus Y.

ND 530 and ND 626 had produced good yields of high quality tubers in 1948, with plants showing no necrotic lesions of virus Y. Greenhouse plants of both selections made vigorous growth, showed a faint mottle at low temperatures, and by juice inoculation produced virus-Y symptoms in Physalis floridana. ND 530 plants were smaller and less vigorous (mild crinkle) and showed a faint mottling or pebbling of the foliage early in the season in the field in 1949. The plants reached a more normal size late in the season but were not as large and robust as in 1948. ND 626 plants in the field in 1948 and in the greenhouse were quite vigorous but were dwarfed and delicate in the field in 1949.

White Varieties

The white varieties as a group are somewhat higher yielding than the red-tuber variety group in these trials. The white varieties, other than Essex, rank above the red-tuber varieties in average specific gravity.

The Cobbler variety yielded well and was high in specific gravity, ranking significantly above other named varieties except Cayuga in this quality.

Kennebec was late in maturity, made large vines, was only slightly infected by virus Y, and yielded well. Kennebec was significantly above Essex and significantly below Cobbler in specific gravity. Kennebec tubers were somewhat uneven in shape and averaged larger than those of the other trial varieties. They were quite free of scab.

Essex, also late in maturity, yielded well but was low in specific gravity. Essex plants developed many roots and stolons and set many tubers. These averaged slightly smaller than those of Cobbler. A number of shallow lesions of common scab were noted on Essex tubers. As these trials were not infected by late blight the good yields of Essex and Kennebec were obtained without the advantage of their resistance to this disease.

Cayuga was significantly above other varieties in specific gravity but was low in yield and size of tubers. Cayuga tubers were of good shape, flaky brown, and almost entirely free of scab.

ND 530 was similar to Cobbler in maturity, yield, and specific gravity. Tubers were well shaped, but in certain trials and in all field plantings this selection suffered considerable injury from scab. This susceptibility to scab will remove it from commercial consideration in this State.

ND 148-84 in these trials and in field plantings has yielded about the same as Cobbler. It is similar to Kennebec in specific gravity and to Cayuga in tuber size. The tubers are quite smooth and have a brownish rather than a white color. ND 148-84 is midseason in maturity.

Red Varieties

Triumph yields were fair. In specific gravity Triumph was significantly below most trial varieties and significantly above Red Pontiac.

Satapa produced large yields and was significantly above Red Pontiac, Triumph, and Waseca in specific gravity. Tubers averaged larger than those of Triumph and Cobbler and were quite free from growth cracks which were common in the 1948 crop of this variety.

Red Pontiac and Satapa were the highest-yielding red varieties. Red Pontiac and its sister selection LaSoda were high in average tuber weight, with tubers almost as large as those of Kennebec. Red Pontiac was low in specific gravity.

LaSoda ranked significantly above Red Pontiac and Triumph in specific gravity and intermediate between these varieties in yield. Pinkish red skin color distinguishes LaSoda tubers from those of the other trial varieties.

Waseca was earlier than Triumph and similar to Triumph in tuber characters, yield, and specific gravity. Waseca tubers suffered considerable pitted scab injury in a number of trials.

ND 626 plants were small, infected with virus Y, and consistently low in yield. Tubers were smooth, quite free of scab, and of good red color.

Progress was similar to Triumph in yield and ranked significantly above Red Pontiac, Triumph, and Waseca in specific gravity. Tubers were smooth and of good red color but in these trials rather small in size, averaging one-half the size of Red Pontiac and LaSoda and three-fifths the size of Triumph and Cobbler.

Plantings at Potato Research Farm

The Red River Valley Potato Growers Association and its executive secretary, Mr. William C. Case, have provided valued assistance to the potato-breeding work and provided trial plots on the Potato Research Farm of the Association. This farm is 6 miles southwest of Grand Forks in a district of intensive commercial production of potatoes.

Promising selections and breeding lines were selected from the several collections of material received from other breeders. A number of these was free of scab which was moderately severe in areas of the plots. Five thousand first-year seedlings of 180 crosses from the program of Dr. H. O. Werner (Nebraska) were grown from rather small tubers. These made vigorous growth, and the vine type was attractive. The yield was about equal to that of North Dakota seedlings grown from somewhat larger tubers but was almost always made up of a large number of tubers with low average size. A number of attractive dark red tuber selections were secured from the Nebraska families.

Forty-two hundred seedlings were grown from good-size seedling tubers grown from seed supplied by Dr. F. J. Stevenson. These crosses included in their parentage many selections with resistance to late blight, common scab, virus X, or other diseases. A full assortment of selections from these crosses was not secured because of low yield and small tuber size. Several selections are being saved to continue the study of their adaptability.

The 25,000 seedlings of North Dakota crosses included 6,025 seedlings of crosses with varieties and 4,336 seedlings of crosses with USDA selection B 61-3. The companion parents with B 61-3 in these crosses were susceptible to scab, and none of the 48 families was noticeably less infected by scab than unrelated crosses. Scab was common and often severe in 1,450 seedlings of 15 crosses in which the scab susceptible ND 530 was a parent.

A number of selections was quite free from top infection by virus Y. Under conditions where most varieties have suffered heavy infection and developed top necrosis in many or all plants, certain stocks such as Katahdin and Kennebec show only a few infected plants, often with only small necrotic lesions. This slight susceptibility or high resistance has been found in a number of selections. One of these is ND 457-1 on which necrotic specks were found on branches of only two of several hundred plants. ND 457-1 is a selection of a cross of Sebago x ND 92.36-5 (Houma x Minn. 17-2).

NORTH DAKOTA

Roland G. Timian

One hundred eighty-six seedling selections and 30 named varieties were grown at Fargo, N. Dak., to determine their resistance to the Y virus. Of the seedlings, 74 were USDA selections, one was from New York (Cornell), 8 from Colorado, 3 from Iowa, 18 from Nebraska, 71 from North Dakota, and 11 North Dakota selections from Wisconsin seedling families.

Selections and varieties were planted at random in a plot that was approximately square. As a source of inoculum for field transmission by insects and foliage contact, ND 530, a Y virus carrier was planted every third row. In addition to this opportunity for field infection from the Y-carrying plants, 5 plants in each selection and variety were mechanically inoculated, using the carborundum method, with expressed juice from Pontiac plants known to be infected with only the Y virus.

Frequent observations of the plot were made from the time of emergence until harvesting. Early blight was prevalent during the latter part of the season, making readings difficult if not impossible.

Shortly after emergence all selections and varieties were tested on the indicator plants Gomphrena globosa L. and Physalis floridana Rybd. for the X and Y viruses. The selections and one variety showing no foliage symptoms in the field are being tested on indicator plants in the greenhouse at the present time.

In Timian table 1 is listed all selections and varieties that showed symptoms in the field from either the tuber-carried virus or from current-season contraction of the virus.

Timian table 2 lists those selections and varieties in which no Y virus symptoms were detected in the field in 1949 but did show symptoms when grown in the greenhouse in 1950.

Until final results are obtained in the greenhouse from inoculations to P. floridana, it will not be known if 3 selections and 1 variety are free of or carrying the Y virus.

Symptoms observed in selections and varieties grown from Y infected tubers varied from a faint mottling to severe crinkling and stunting, giving a typical rugose effect even in the absence of the X virus. Necrotic stem lesions were present in many selections and varieties with subsequent leaf dropping. Many selections and varieties had little if any tuber formation.

The most common and almost universal current season symptom was the formation of brown to black necrotic areas, usually following the veins on the under surface of the leaves. Later, this necrosis passed down the petiole to the main stem and the leaf, then collapsed, rapidly withering and remaining hanging. Mottling was observed in some, and a few showed severe defoliation.

Acknowledgment is hereby granted to Dr. Wm. G. Hoyman for his kindly counsel and advice in conducting this work.

Timian table 1. Selections and Varieties that showed Y virus symptoms in the field, 1949.

U.S.D.A.

B 61-3
B 62-1
B 67-11
B 69-16
B 70-4
B 71-4
B 73-2
B 73-3
B 73-10
B 73-16
B 73-18
B 75-4
B 76-23
B 76-33
B 76-43
B 87-1
B 89-2
X 96-44
X 96-56
B 137-5
B 142-7
B 204-4
B 235-16
B 278-27
B 287-2
B 287-8
B 313-21
B 351-44
B 355-44
B 381-2
B 400-1
B 402-1
B 434-127
B 434-158
B 446-8
B 447-98
B 459-31
X 494-1
B 505-53
B 515-2
X 590-7
B 594-15
B 598-29
B 602-14
B 604-10
B 606-77
B 607-107

B 608-9
B 608-56
B 638-12
B 721-1
B 738-17
B 759-2
B 759-34
B 762-1
B 766-44
B 766-80
B 778-28
B 779-1
B 904-8
B 920-13
X 927-3
B 935-9
B 962-22
X 1276-185
46952
X 47258

New York

DVAO (Cornell)

Colorado

CS 1111
CS 3305
CS 6316
CS 6317
CS 8878
CS 8913

Iowa

I 44-33-2

Nebraska

Neb. 24.38-3
Neb. 43.41-1
Neb. 46.41-2
Neb. 85.41-1
Neb. 97.41-1
Neb. 25.42-2
Neb. 38.42-3
Neb. 113.43-1
Neb. 117.43-6
Neb. 209.43-1
Neb. 213.43-2
Neb. 213.43-3
Neb. 225.43-1
Neb. 311.43-1
Neb. 151.44-4
Neb. 152.45-1

North Dakota

ND 242-2
ND 300-2
ND 300-12
ND 317-24
ND 317-27
ND 317-28
ND 317-30
ND 334-3
ND 334-7
ND.337-10
ND 339-4
ND 339-5
ND 346-4
ND 346-5
ND 355-8
ND 355-9
ND 364-5
ND 371-6
ND 371-5
ND 372-1
ND 397-5
ND 404-8
ND 408-2
ND 439-5
ND 457-1
ND 472-3
ND 485-4
ND 499-7
ND 504-3
ND 509-2
ND 513-5
ND 530
ND 530-5
ND 541-8
ND 563-1
ND 600-3
ND 619-1
ND 619-4
ND 623-1
ND 624-1
ND 626
ND 626-1
ND 626-9
ND 680-5
ND 684-2
ND 694-5
ND 694-7
ND 699-1
ND 701-5
ND 701-7
ND 766-9
ND 766-12
ND 769-1
ND 782-1
ND 833-1
ND 833-4
ND 833-5
ND 833-6
ND 833-7
ND 833-8
ND 840-1
ND 841-3
ND 841-6
ND 842-9
ND 842-10
ND 952-4
ND 984-1
ND 1068-2
ND 1078-2
ND 1084-2

No. Dak. Selections from Wisc. seedling families

WN 900-1
WN 900-3
WN 900-6
WN 900-11
WN 900-13
WN 900-16
WN 900-17
WN 903-22
WN 903-24

Named Varieties

Cobbler
Earlaine
Essex
Green Mountain
Houma
Katahdin
Kennebec
La Soda
La Salle
Marygold
Mesaba
Mohawk
Ontario
Pawnee 1/
Red McClure
Red Pontiac
Rural New York
Russet Sebago
Satapa
Sebago
Sequoia
Teton
Warba
Wasaca
White Cloud
White Rose

1/ Showed only mottle, virus X present. Further tests being made to determine if Y virus is present.

Timian table 2. Selections and Varieties in which Y virus symptoms were absent in the field during 1949 but present in the greenhouse in 1950.

Selections and varieties and their source with Y virus symptoms absent in field, 1949; present in greenhouse, 1950.

U.S.D.A.	Colorado	Nebraska	Wisconsin N. Dakota	Iowa	Named varieties
B 91-14	CS 6392	Neb 60.37-9	WN 900-4	I 44-8-4	Cayuga 1/
B 759-6		Neb 217.43-1	WN 903-21	I 44-16-1	Chippewa
B 779-8					Menominee
B 1127-97					

1/ Showed only mottle, virus X present. Further tests being made to determine if Y virus is present.

The USDA selection B 91-4 showed no symptoms of the Y virus in the field 1949 or in the greenhouse to date (January 27, 1950), but gave a positive reaction on P. floridana.

The USDA selections X 157-9 and B 738-8, the Colorado selection CS 3038, and the variety Snowdrift showed no Y virus symptoms in the field 1949 or in the greenhouse to date (Jan. 27, 1950). None of the above have to date shown any symptoms on P. floridana.

OHIO

J. P. Sleesman

The investigations in 1949 consisted of testing seedlings for resistance to leafhoppers, flea beetles, qualities of commercial importance, and yield. A number of seedlings were supplied by the United States Department of Agriculture and the remainder were obtained from unselected progenies received from Dr. Stevenson during the period from 1944 through 1947. Nine of the Ohio selections were increased by Mr. Akeley in Maine for further testing in Ohio.

Leafhopper populations were relatively low again this year and there may be a relationship between the low leafhopper populations which occurred during the past few years and the wide-spread use of DDT inasmuch as this insect is very susceptible to this insecticide and is killed by minute quantities of the chemical. Late blight was practically absent from the planting but early blight was an important factor in reducing yields.

Eight numbered varieties were compared with 52 numbered seedlings in a planting at Wooster. One-half of the planting of each variety or seedling was sprayed with a combination insecticidefungicide mixture at 10-day intervals; the other half remained unsprayed throughout the growing season. Data were obtained on yield, foliage condition, leafhopper nymphal populations, amount of adult flea beetle feeding, and the percent increase in yield due to the application of a pesticide (Ohio table 1). Seedling B 478-1 from the cross Sequoia X 96-56 again showed a high degree of resistance to the potato leafhopper. It is a high yielding variety but it produces rather large, coarse tubers of average cooking quality. There is a definite tendency for the tubers of this seedling to growth-crack. Seedlings B 934-1 (055 x B 294-38), B 939-3 (41956 x B 294-38), B 942-1 (B 294-22 x B 294-38), and B 604-1 (528-194 x Teton) were high yielding sorts and produced nicely shaped tubers.

Approximately 3800 first-year seedlings representing 26 progenies received from Dr. F. J. Stevenson were grown at the State Muck Crops Experiment Farm at Celeryville, Ohio. About 280 seedlings were selected for further study, a number of which were from crosses involving seedling B 478-1 as a leafhopper resistant parent. Dr. C. E. Peterson of the Iowa Agricultural Experiment Station sent approximately 4,000 first-year seedlings from 73 different crosses. These seedlings were grown at Wooster on upland soil and 281 selections were made which will be planted again in 1950.

Seventy-five seedlings selected in previous years were grown in a tuber unit plot this year at Wooster in cooperation with Dr. John Bushnell of the Department of Horticulture. About one-half of these lots were discarded and the remaining seedlings will be increased again next year in tuber unit plots, along with a portion of the tubers saved of each selection made from the first-year seedlings. All seed increase plots will be sprayed with 15 percent wettable parathion powder at the rate of 1 pound in 100 gallons fungicide spray mixture.

Ohio table 1. Yield, leafhopper nymphal populations, adult flea beetle injury, foliage condition, and the effect of spraying with a pesticide on the yield for 60 named or numbered seedlings, Wooster, Ohio. 1949.

Variety or seedling	Yield per acre 1/	Leafhopper nymphs per 100 leaves 2/	Flea beetle holes per leaflet 2/	Dead foliage on Sept. 13		Yield increase due to sprayin
				Unsprayed	Sprayed	
	Bu.	No.	No.	Pct.	Pct.	Pct.
B 934-1	723	10	20	25	5	63
B 478-1	707	5	17	40	5	56
B 939-3	678	5	18	45	5	32
B 942-1	675	30	24	20	5	69
Ashworth	630	10	31	100	15	103
B 604-1	609	30	24	80	10	70
B 941-3	596	5	30	85	10	61
Sequoia	575	40	16	15	5	19
Ontario	569	30	13	25	5	91
B 639-8	557	20	25	100	55	56
B 724-1	542	30	19	35	10	46
B 931-1	531	15	10	75	10	74
Virgil	529	35	17	80	10	50
B 725-8	527	70	23	100	35	83
B 313-32	526	15	21	95	15	13
B 313-16	525	15	10	100	20	77
B 941-1	525	25	27	90	5	183
B 638-16	517	10	32	100	100	123
B 724-24	514	50	31	90	10	79
B 313-21	514	50	29	100	70	41
B 923-4	511	30	18	95	30	63
B 881-1	508	20	19	100	15	65
B 942-2	502	10	27	40	5	81
B 939-1	497	10	16	55	10	44
B 959-4	496	40	27	40	10	38
B 493-3	493	20	25	75	10	126
B 137-5	492	10	34	95	20	97
B 941-5	485	30	26	100	20	69
B 959-2	471	35	13	100	15	111
B 724-11	460	30	9	25	5	17
B 616-58	454	20	21	100	90	93
B 69-16	450	5	30	100	35	39
B 287-10	445	35	27	100	45	127
B 881-1	443	5	30	100	40	68
Katahdin	435	40	20	100	25	68

Ohio table 1. (continued)

Variety or seedling	Yield per acre 1/	Leafhopper numphs per 100 leaves 2/	Flea beetle holes per leaflet 2/	Dead foliage on Sept. 13		Yield increase due to spraying
				Unsprayed	Sprayed	
	Bu.	No.	No.	Pct.	Pct.	Pct.
B 280-2-41	434	5	27	55	20	30
B 724-2	434	55	36	95	45	86
DeSoto	425	25	29	100	75	103
B 959-5	425	25	18	15	10	57
I. Cobbler	423	154	17	100	65	94
B 616-78	421	35	28	100	60	83
B 941-2	403	15	17	100	85	48
B 608-56	401	25	14	100	35	122
B 73-16	400	5	29	75	10	45
B 939-2	391	30	21	100	40	111
B 881-4	388	5	16	95	5	45
B 505-53	385	80	15	100	90	97
B 881-2	377	10	24	90	15	122
B 939-4	375	30	22	60	5	118
Placid	373	5	9	100	45	96
B 959-3	372	10	15	45	10	109
LaSalle	366	35	22	100	70	76
B 923-1	352	25	14	100	10	120
B 639-10	337	20	31	100	15	72
B 354-18	333	15	36	100	85	57
B 881-5	330	35	7	30	15	151
B 738-16	320	40	13	100	90	96
B 941-1	307	40	15	100	75	81
B 493-1	263	20	21	100	90	56
B 923-3	259	20	7	45	25	89

1/ Mean of 4 replications of 25-hill single-row plots grown in randomized blocks. Planting date May 27.

2/ On unsprayed plots.

Pennsylvania

J. S. Cobb

Three groups of seedlings were tested in Pennsylvania in 1949; early, medium late, and late. These varieties were planted on stony sandy loam soil on June 3 and harvested on October 15. The data for source of seed and yield are given in Pa. tables 1, 2, and 3.

Chippewa yielded the most in the early group, but the variability was so grea that most of the differences shown in the table are of doubtful significance (table 1).

Pa. table 1. Source of seed and yield data of a number of early varieties of potatoes grown in Pennsylvania in 1949.

Variety	Source of Seed	Yield per acre
Early varieties		Bu.
Warba	Livermore Seed Co., N. Y.	227
Early Ohio	" " " "	262
Triumph	" " " "	348
Triumph	Maine	322
Cobbler	Livermore Seed Co., N. Y.	383
Cobbler	U. S. Dept. Agr.	261
Chippewa	Livermore Seed Co., N. Y.	412
Chippewa	New York State	395
Chippewa	U. S. Dept. Agr.	337
Pawnee	" " "	236
X 1276-185	" " "	328
L. S. D.		65.3

Essex grown from New York State seed gave the highest yield in the medium late group. There seems to be a significant difference between the Essex grown from New York State seed and that grown from seed obtained from the K. C. Livermore Seed Company also of New York, but, again, the variability was unusually large and the differences may not mean too much.

Pa. table 2. Source of seed and yield data of a number of medium late varieties of potatoes grown in Pennsylvania in 1949.

Variety	Source of Seed	Yield per acre
		Bu.
Katahdin	Livermore Seed Co., N. Y.	563
Katahdin	U. S. Dept. Agr.	398
Essex	Livermore Seed Co., N. Y.	595
Essex	New York State	747
Erie	U. S. Dept. Agr.	407
Erie	Ohio	501
Teton	U. S. Dept. Agr.	567
Teton	Potter Co., Penn.	548
Pontiac	Livermore Seed Co., N. Y.	517
Pontiac	U. S. Dept. Agr.	605
Pontiac	New York State	493
Mohawk	U. S. Dept. Agr.	461
Green Mountain	" " "	523
Houma	" " "	476
L. S. D.		101.3

Table 3 gives the data for the late varieties. If the least significant difference of 89.2 bushels is taken into consideration and the other varieties are compared with Kennebec it will be seen that Norkota, Marygold Cayuga, U. S. D. A. Sebago, Mohawk from the Livermore Seed Co., Mohawk New York State, and Blue Victor yielded significantly less than Kennebec. The others were all in the same class with respect to yield (table 3).

Pa. table 3. Source of seed and yield data of a number of late varieties of potatoes grown in Pennsylvania in 1949.

Variety	Source of Seed	Yield per acre
Late varieties		Bu.
Norkota	U. S. Dept. Agr.	312
Marygold	" " "	397
Kennebec	" " "	553
Cayuga	" " "	330
Ontario	" " "	473
Ontario	New York State	480
Sebago	U. S. Dept. Agr.	420
Sebago	New York State	539
Sequoia	U. S. Dept. Agr.	504
Sequoia	New York State	534
Mohawk	Livermore Seed Co., N. Y.	392
Mohawk	New York State	459
Rural	" " "	469
Russet Rural	Eastern States Farmers Exchange	565
Blue Victor		418
L. S. D.		89.2

PENNSYLVANIA

W. R. Mills

Late Blight

Late blight was less prevalent in Pennsylvania in 1949 than in any recent year, due to extremely hot and dry conditions in July and August. Somerset County, a high-altitude, northern-tier county, was an exception, with practically normal rainfall. We were, however, quite surprised to find in that county on July 8 a field of badly blighting Essex. Many growers in the county had small plantings of Essex, and despite spraying, blight became general in all fields by September 1. In addition to Somerset County, blight was also reported in Essex from one central county.

All of the named blight-resistant varieties are susceptible to the new race; they all possess the same gene for blight resistance. A total of three distint genes for resistance has been identified among the descendants of Solanum demissum. Intercrossing of plants carrying different genes will produce immunity to all of the races of the fungus which have been isolated from the field. Many of the crosses made during the last 2 years have been of this nature. A majority of the 5,000 seedlings grown in 1949 were survivors of inoculation with a mixture of all races.

Yield

Late blight did not appear in the field at State College and so was not a factor in yield. Early- and late-maturing varieties were divided into separate blocks for yield trials. Eleven early and 21 late varieties were planted in 5-replication plots; 21 early and 55 late varieties in 2-replication blocks. All varieties were sprayed twice with DDT only. Yields were very satisfactory; 55 of the 108 varieties under trial produced over 500 bushels per acre, with 12 exceeding 600. The highest yield in the field, 653 bushels per acre, was produced by selection 3DA-1, in the 5-replication block. In 1948, in two replications, 3DA-1 produced 662 bushels per acre. It will be included in the regional trials in 1950.

Regional Trials

As in past years, regional trials were conducted in cooperation with the Extension Department and included new and old named varieties, as well as Penn State selections. Sixteen varieties were planted in replicated plots in five counties. In Somerset County, blight was present to severe on all varieties. In the remaining four locations the resistant varieties remained blight-free. A summary of yield results is presented in Pa. table 1, where they are compared with results of similar tests in 1948.

For the third consecutive year, Essex ranked first in total production and in yield of U.S. No. 1 tubers. Under our conditions, Essex leaves considerable to be desired in market and table quality, but it has remarkable yielding ability. Teton, which we have pushed because of its ring-rot resistance, developed a serious amount of drought spot, particularly in the sections of the State where heat and drought were most severe. Selection 2XJ-1 is something of an enigma. It is much too late in maturity,

but with good growing conditions in September, the yield is high and tuber quality is excellent. In 1948, chipping samples were taken from two of the plots. In one test, the sample was chipped in March, while in the other, one or two tubers were chipped each month of the winter. Both tests showed 2XJ-1 to chip about as well as the standard Russet Rural. More extensive tests are being made this year. It also appears to have resistance to leaf roll. During the past 3 years we have critically examined around 6,000 hills and have detected no leaf roll.

Pennsylvania table 1. Comparison of 1948 and 1949 yields.

Variety	Rank		Yield per acre						Rank	
			Total		US #1		US #1		US #1	
	1948	1949	1948	1949	1948	1949	1948	1949	1948	1949
			Bu.	Bu.	Pct.	Pct.	Bu.	Bu.		
Very Late:										
2XJ-1	3	3	599	625	74	82	443	511	3	2
3HO-11	-	8	-	548	-	56	-	308	-	16
Russet	11	9	483	542	73	61	353	330	14	14
Ontario	4	4	551	609	78	79	430	482	5	6
Sebago	9	15	531	469	82	84	412	396	7	10
Medium Late:										
Essex	1	1	630	697	77	78	485	544	1	1
Kennebec	2	2	599	673	77	72	461	485	2	5
2UB-15	-	5	-	603	-	51	-	310	-	15
Teton	6	6	537	602	82	83	440	502	4	3
Katahdin	8	7	504	588	81	84	408	496	8	4
Early:										
BP-7	12	10	477	533	79	80	377	425	10	7
Cobbler	14	11	459	498	80	74	367	369	11	11
BN-5	10	12	486	493	72	74	350	367	15	12
Snowdrift	15	13	459	492	77	83	353	407	13	8-9
Chippewa	-	14	-	478	-	85	-	407	-	8-9
LaSalle	-	16	-	455	-	74	-	336	-	13

RHODE ISLAND

T. E. Odland

In 1949 fifteen varieties were tested for yield at Kingston, R. I. The data for these tests are given in Rhode Island table 1. Five varieties, Houma,

Rhode Island table 1. Yield data for 15 potato varieties tested for yield at Kingston, R. I., in 1949.

Variety	Yield U. S. No. 1 per acre		Tubers	
			Size	Shape
	Bu.	Pct.		
Chippewa	379	88	Medium	Smooth regular
Erie	345	95	Medium	Rough
Green Mt.	347	94	Large	Rough irregular
Houma	418	89	Medium	Medium rough, irregular
I. Cobbler	323	91	Medium	Medium rough, irregular
Katahdin	364	95	Medium	Smooth regular
Kennebec	413	97	Medium	Smooth regular
Mohawk	317	97	Large	Rough irregular
Ontario	339	87	Medium	Smooth regular
Pontiac	435	96	Large	Rough irregular
Potomac	268	91	Medium	Rough irregular
Sebago	345	96	Large	Smooth regular
Sequoia	339	95	Large	Rough, irregular
Teton	431	97	Medium	Smooth regular
1276-185	413	93	Medium	Smooth irregular
L. S. D.	56			

Kennebec, Pontiac, Teton, and 1276-185, outyielded the standard Green Mountain significantly. Chippewa, Erie, Irish Cobbler, Katahdin, Mohawk, Ontario, Sebago, and Sequoia were all in the same class as Green Mountain. Potomac was the only one of the 15 varieties that yielded significantly less than the standard variety Green Mountain.

A study of the size and shape shows the Green Mountain tubers to be large, rough, and irregular. In contrast to this, the tubers of the Chippewa, Katahdin, Kennebec, Ontario, Sebago, Teton, and 1276-185 were all smooth and regular. The tubers of the Mohawk, like those of its Green Mountain parent, were large, rough, and irregular.

The 1949 season was the most deficient in rainfall at Kingston in more than 50 years. The dry spell began in early May and continued until the last of August. Late blight was not a factor since the drought kept it in check. The potatoes were planted on April 20 and harvested on September 13 and 20. Yields in the table were calculated from 32-foot rows replicated 4 times.

South Carolina

William M. Epps

The potato crop in 1949 in South Carolina was only fair. Unusually warm weathe following planting resulted in the emergence of the plants during the last week of February, several weeks ahead of their normal schedule. Several killing frosts during March cut the plants back and caused a poor stand, particularly i certain varieties. A late season drought further reduced the yield.

Replicated trials were planted on the station farm and on three growers' farms in Charleston and Beaufort Counties. These plantings included the five locally grown varieties, Katahdin, Cobbler, Sebago, Bliss Triumph, and Pontiac, the new variety, Kennebec, and three promising seedlings, B 61-3, B 76-43, and B 137-5. Due to a shortage of seed B 73-10 and B 73-16 were planted only on the station farm. Of the four trials, one (John's Island) suffered very little from frost or drought, a second (station) suffered some from frost but was irrigated during the drought, a third (Burton) was planted late and missed the frost but was on sandy land and suffered severely from the drought, and the fourth (Maryville) was planted early and suffered severely from frost and moderately from drought. The Yields of these trials are shown in S. C. table 1.

S. C. Table 1. The performance of potato varieties and seedlings on four farms in South Carolina - 1949.

Variety	Final Yield per Acre No. 1 Size A				Average	*Late blight
	John's Is.	Truck Station	Burton	Maryville		
	Bu.	Bu.	Bu.	Bu.	Bu.	
B 76-43	458	358	393	126	334	0
Kennebec	426	353	327	213	330	tr.
B 73-10	-	332	-	-	-	0
B 137-5	354	323	296	244	304	5
B 73-16	-	322	-	-	-	5
B 61-3	386	308	297	202	298	0
Katahdin	316	270	249	196	258	5
Cobbler	317	280	211	167	244	5
Sebago	258	272	253	140	231	3
Pontiac	287	275	252	96	227	5
Bliss	350	267	194	87	224	5
LSD 5%	42.4	39.6	45.6	54.9		
1%	56.7	52.7	61.0	73.5		

* 0 = No blight; tr = trace; 3 = intermediate; 5 = killed.

These results indicate that these new potatoes are all more productive than the old standards. The poor yields of B 76-43 and Pontiac at Maryville were largely due to their inability to come back after being cut back by frost. The stands of these two varieties were particularly poor. At Burton and Maryville the low yields of Cobbler and Bliss appear to be due to their relative sensitivity to drought.

Kennebec produced a high yield of attractive potatoes and was found to be highly resistant to late blight. Its primary disadvantage is its late maturity. B 73-10 also produced a high yield of smooth attractive potatoes. It was highly resistant to blight and has been found in past years to be resistant to scab. It was about as early as Katahdin, midseason under South Carolina conditions. B 61-3 was productive, blight- and scab-resistant, and slightly earlier than B 73-10. The tubers were not so smooth and might not be satisfactory. Further tests on these three new potatoes are planned for succeeding years.

B 76-43 tubers were too rough and for this reason would be unacceptable in spite of its high yield and resistance to scab and blight. B 137-5 was susceptible to blight and scab, but was saved in past years because of its high yield of long smooth attractive tubers. The 1949 crop, due probably to the late season drought, was of poor appearance. B 73-16 produced a high yield of attractive tubers, but its superiority over B 73-10 is not sufficient to offset its susceptibility to disease.

All other varieties and seedlings tested were included in replicated trials on the station farm. Yields and relevent notes are presented in S. C. Table 2.

S. C. Table 2. Performance of potato varieties and seedlings on the Clemson College Truck Experiment Station Farm - 1949.

Variety	Yield per acre		*Late Blight	Tuber Appearance	*Maturity	Remarks
	Test 1	Test 2				
	Bu.	Bu.				
B 73-2	390		0	Good	M	Long tubers
Kennebec	350	380	tr.	Good	L	One blight lesion.
B 87-1	348		5	Fair	M	Tubers too rough.
Teton	325	352	5	Good	M	
B 73-3	317		0	Good	ML	Oval tubers
B 355-44	297		0	Fair	L	Tubers too rough
Sebago	290		3	Exc.	L	
Mohawk	287	307	5	Good	ML	Long tubers
Cobbler	285	293	5	Fair	E	Tubers roug
Katahdin	278		5	Exc.	M	
B 76-23	272		0	Good	M	Round tubers
B 75-4	202		0	Exc.	ML	Too unproductive.
Marygold		402	5	Poor	L	Yellow flesh
1276-185		343	?	Fair	M	Round rough tubers
LSD 5%	65.4	29.9				
1%	87.9	40.8				

*Late blight resistance 0 = no blight to 5 = killed by blight. Maturity E - early; M = Midseason; ML - mid late; L - Late.

Late blight was present in one unsprayed replicate, but had little effect on the final yield. Perfect control was obtained in the sprayed replicates.

The South Carolina growers have recently started to wash their potatoes on a large scale. Rough deep-eyed tubers, such as those of Cobbler, are not easily cleaned and as a result the acreage of Cobbler in the State has decreased enormously. The State needs a potato as smooth as Sebago or Katahdin, at least as early as Katahdin, and resistant to late blight. Several potatoes, such as B 76-43 and B 355-44, were discarded because they produced tubers that are too rough to fit into the washing program.

VIRGINIA (Blacksburg)

Flood S. Andrews

The varieties Cobbler, Chippewa, Kennebec, Katahdin, Sequoia, and Sebago were grown from Maine seed and from seed grown in southwest Virginia. LaSalle and Pontiac grown from Virginia seed were also included in the test. Each lot was grown in four randomized blocks. The rows in each replication were 40 feet long with a distance of 3 feet between rows and 15 inches between plants in the row. Fifteen hundred pounds of 5-10-5 fertilizer per acre was used. The plants were dusted once a week with 7% copper and 3% DDT. The season was too wet for the best results.

Andrews table 1 gives the yield data for these tests. In the tests grown from V.P.I. seed, Pontiac ranked first, closely followed by Sequoia and Katahdin. Kennebec was fourth and LaSalle last in rank. In the tests grown from Maine seed Kennebec ranked first with no significant difference between Kennebec and Sebago, but the yield of Kennebec was significantly higher than that of the other four varieties. A comparison between the two seed sources indicates that Cobbler, Katahdin, and Sequoia produced comparable yields grown from seed from the two sources. On the other hand, Kennebec, Chippewa, and Sebago grown from Maine seed gave significantly higher yields than they did when grown from V.P.I. seed.

Andrews table 1. Yield of potatoes in U. S. No. 1 pounds per plot from U.S.D.A. seed (Maine-grown) and V.P.I. seed (southwest Virginia).

Variety	Mean yield per plot from:	
	V.P.I. seed	Maine seed
	Lb.	Lb.
Cobbler	44.5	43.6
Chippewa	40.8	60.8
Kennebec	58.1	80.1
Katahdin	68.1	57.8
Sequoia	70.4	62.1
Sebago	51.5	76.0
LaSalle	32.5	----
Pontiac	72.4	----
L.S.D.	13.9	13.9

VIRGINIA (Norfolk and Onley)

M. M. Parker

The 1949 potato-breeding program in eastern Virginia centered around the development and testing of blight-resistant varieties suitable for early and late crop production in the coastal part of the State. Blight does not consistently attack the early crop here, but it does occur often enough to cause serious trouble, and it seems to be becoming increasingly destructive, noticeably where growers use irrigation. Usually the late crop, planted in July, is attacked every year, and frequently the plants are killed before satisfactory yields are made. Since potato growers here do not have the proper equipment to apply proper control measures for blight it has become essential to develop resistant varieties.

In our attempts to produce satisfactory seed stock, we have been checked by the loss of vigor that potato seed suffers when grown as an early crop and by the difficulty of keeping the seed free from virus diseases. These two handicaps have caused us to lose most of our selections and developments, and have made us concentrate on the late crop, which retains seed vigor but which is subject to virus infections. This report will, therefore, deal more with the testing of selections made in other parts of the country rather than with progress with selections made at this station.

In our spring trials duplicate plantings were made at Norfolk and at Onley, Va. At Norfolk irrigation was used several times during the growing season to keep the soil moisture suitable for good growth of plants. At Onley irrigation was not used and a deficiency of rainfall gave a good comparison of the same lots of potatoes under optimum and limited soil moisture at the two locations.

About 12 named blight-resistant varieties were placed in the test, along with about 50 selections from the U.S.D.A., some of which were resistant to blight. Also included was a number of selections made at Norfolk in 1948 from the progeny of true flower seed furnished by the U.S.D.A. All lots were planted in replicated plats in a yield test with standard commercial named varieties. Blight was not noticeable on either of the spring plantings in 1949, which provided an opportunity to compare the yielding capacity of resistant and susceptible varieties when each lived their normal life span. At Norfolk the average yield from 5 of the highest-yielding resistant varieties was 9 percent larger than that from 5 of the best-yielding susceptible varieties. However, the highest-yielding resistant one produced a 60 percent larger yield than that from the Cobbler, which is the standard early crop potato of this section. At Onley where a deficiency of moisture was the limiting factor, the yield was about the same for both resistant and susceptible kinds, but individually the highest-yielding resistant one was 51 percent better than the Cobbler. It would seem that even where blight is of no consideration, most resistant varieties potentially have greater yielding possibilities than the Cobbler.

Va. table 1 gives the yield of primes in 100-pound sacks of primes per acre

Va. table 1. Yield of named varieties and seedlings in 100-pound sacks of primes per acre and days to maturity from spring-crop plantings at Norfolk and Onley, Va., 1949. Planted March 8th. Harvested June 20 - July 11.

Varieties & seedlings	Source of seed	Days to maturity		Yield of primes per acre	
		Norfolk	Onley	Norfolk, Grown with irrigation	Onley, Grown with 10" rainfall
		No.	No.	100-lb. sacks	100-lb. sacks
Ashworth	New York	113	119	193	149
Chippewa	Maine	113	119	305	199
Chenango	New York	113	112	211	174
Cobbler	Maine	106	112	236	112
DOD[2]	New York	113	112	217	149
Empire	New York	124	124	55	75
Essex	New York	124	119	379	187
Erie	Maine	124	119	261	174
Fillmore	New York	124	119	31	25
Katahdin	Maine	124	119	224	186
Kennebec	Maine	124	119	342	168
La Salle	Virginia	106	112	223	124
Marygold	Maine	124	119	292	187
Norkota	Virginia	124	-	174	124
Pontiac	Maine	106	119	311	205
Placid	New York	113	112	236	211
Sebago	Maine	124	119	224	155
Snowdrift	New York	113	112	267	137
Teton	Maine	124	-	267	168
Virgil	New York	124	124	55	75
73-2	Maryland	124		236	193
70-4	Maine	-		224	193
73-3	Maine	-		224	180
61-3	Maine	113		255	180
61-3	Maryland	113		193	143
94-2	Maryland	124		224	149
91-14	Maine	113		180	106
96-44	Maine	106		187	137
96-56	Maine	106		243	118
75-4	Maine	106		170	149
483-13	Maine	106		137	81
46952	Maine	113		187	99
47258	Maine	124		317	187
469-5	Virginia	106		136	-
164-5	Maryland	124		180	-
13-129	Maryland	-		137	-
287-27	Virginia	106		112	-
188-9 x Kat.	"	124		124	100
83-9 x Kat.	"	-		106	-
Mohawk x 96-56	"	-		62	49
Green Mt. x 96-28	"	106		81	68
76-43	Maine	106		298	199
73-10	Maine	113		330	199
89-2	Maine	106		255	137
1286-185	Maine	106		261	143
137-5	Maine	124		292	205
505-75	Virginia			33	

at Norfolk and Onley, and the number of days to maturity from the time of planting seed. None of these lots were harvested until the tops had died completely, and each lot was dug immediately after the tops had given up. Essex and Kennebec were the two highest-yielding varieties at Norfolk, with Essex producing 379 bags per acre and Kennebec, 342. The Essex was characterized by its tall, upright type of growth and the large number of tubers set per plant. A count of the number of tubers set was taken on June 2 when the potatoes were about the size of marbles. Essex had an average of 11 per plant, Sebago 5, and Kennebec 4. Where abundant moisture was supplied the plants, Essex was able to size up a good proportion of the number set, but at Onley where rainfall was limited most of the tubers barely were able to make A-size potatoes. In our opinion, this variety may be well suited to those farms where irrigation is available, but it would be risky to grow it without irrigation. Kennebec set its tubers early and had comparatively few per plant. With a long growing season and under good growing conditions the tubers tended to become overly large, but at Onley they were of desirable size and the majority of them graded out A's. We do believe, though, that the Kennebec, because of its high resistance to blight, and its excellent yields, will be well suited to late-crop production in Virginia.

In the seedling lots several were outstanding and with proper development should be much more satisfactory than present commercial varieties. At the top of the list we would place 76-43, which is a heavy-yielding, blight-resistant kind. It was harvested at Norfolk as early as the Cobbler, and it produced a 26 percent larger yield than that of the Cobbler. At Onley, the yield from 76-43 was 77 percent better than that of the Cobbler. 76-43 seems well suited to early crop production, and with its high degree of resistance to blight should be just as satisfactory for the late crop. 73-10 is also a high-yielding, blight-resistant potato, but it is late in maturity and probably will do best in our late-crop plantings. 89-2 also had considerable resistance to blight, and in conjunction with its ability to produce good yields should be superior to the Cobbler. Where long potatoes are wanted the 164-5 from Maryland and the 137-5 from the U.S.D.A. seemed to fit the bill. However, the shape of tubers from these two lots seemed to vary somewhat from year to year. On some occasions the large proportion of the potatoes were long but in other years the potatoes tended to become oval.

WASHINGTON (Pullman)

Seth Barton Locke

Field testing for resistance to infection by leaf roll virus was continued in 1949 at three locations in the State; namely, Mt. Vernon (western Washington), Prosser (central Washington), and Pullman (eastern Washington). Samples taken from the 1948 plantings were grown in the field at Pullman in 1949 to determine the amount of leaf roll infection. Very poor stands were obtained from some of the samples because of lack of moisture. For this reason the stand (number of hills) on which the virus content is based is given in each case. (See Washington Locke table 1).

Washington Locke table 1. Leafroll pickup in potato varieties at three locations in Washington during 1948.

Variety	Pullman		Prosser		Mt. Vernon		Average leafroll pickup	Maximum leafroll pickup
	Leafroll 1949 pickup	stand*	Leafroll 1949 pickup	stand*	Leafroll 1949 pickup	stand*		
	Pct.	Hills	Pct.	Hills	Pct.	Hills	Pct.	Pct.
Ashworth	0.5	28	49.4	50	31.7	60	27.2	49.4
Calrose	8.0	40	8.0	53	2.4	32	6.1	8.0
Cayuga	.0	44	39.8	67	24.1	58	21.3	39.8
Chenango	4.8	43	.0	25	21.1	60	8.6	21.1
Cortland	2.8	77	8.3	15	13.0	50	8.0	13.0
Essex	.0	69	6.6	50	4.1	72	3.6	6.6
Glen Meer**	.5	--	.0	33	10.0	70	3.5	10.0
Harford	47.1	68	6.5	31	23.3	30	25.6	47.1
Katahdin	7.0	64	8.0	34	.0	36	5.0	8.0
Kennebec***	3.5	59	.0	4	34.6	40	12.7	34.6
Menominee	9.6	73	15.4	39	16.4	55	13.8	16.4
Mesaba	76.7	69	2.4	37	34.3	75	37.8	76.7
Ontario	7.9	54	31.8	38	8.6	20	16.1	31.8
Netted Gem	55.9	95	57.8	45	25.0	52	46.2	57.8
Norkota***	.0	58	29.9	39	17.2	70	15.7	29.9
Placid	3.6	84	20.7	29	6.9	59	10.4	20.7
Snowdrift	.0	45	8.1	9	63.1	62	23.7	63.1
Red Warba	26.0	77	24.5	53	57.4	26	36.0	57.4
Warba	13.8	46	33.4	46	22.9	37	23.4	33.4
White Rose	35.2	78	27.6	46	32.0	49	31.6	35.2
X 1276-185	.0	77	.0	6	.0	64	.0	.0
Sdlg. 6361***	.0	20	4.3	29	7.6	50	4.0	7.6
Average	13.77		17.39		20.71			

* Out of 100 hills planted.
**Heavily (51%) infected with Rugose Mosaic, making it difficult to read leafroll.
***Considerable chronic leafroll in seed planted in 1948.

The average field spread at the three locations was not greatly different: 20.7%, 17.4%, and 13.77%, respectively, in the order named above. Netted Gem showed the greatest average leafroll pickup (46.2%) with a maximum pickup at Prosser (57.8%). Varieties showing resistance to leafroll infection during 1948 were Katahdin, Essex, Calrose, and cross 1276-185. These same varieties, with the exception of Katahdin, showed resistance to leafroll infection in 1947. Ontario showed resistance in 1947, but apparently its resistance was circumvented at Prosser in 1948.

WASHINGTON

J. D. Menzies

In continuation of the program of testing potato seedling lines for field resistance to leaf roll, surviving clones from the 1948 single-hill test were planted in 10-hill units. There were 1,871 and represented 83 separate crosses. As before, leaf-roll-infected Russet Burbank potatoes were planted in every third row for a leaf-roll source. By the end of the season all but 108 of these seedlings were discarded, the reasons for elimination being as follows:

Chronic leaf roll	14 percent
Current-season leaf roll	70 "
Chronic mosaic	7 "
Green dwarf (?)	3 "
No growth	6 "

The loss of 16 percent of these seedlings for reasons other than leaf roll is rather high. It is a question whether the saving in time realized by combining seedling increase with leaf-roll exposure is worth the loss in potential leaf-roll-resistant clones. If, in later years, it is possible to increase the percentage of resistant seedlings in the tests, then probably the initial increase should be made in disease-free areas. The present procedure may be satisfactory while testing for relative resistance in family lines.

The cause of the non-emergence in some lots and the exact diagnosis of the disease listed as green-dwarf are not known. The two conditions appear to be either related or mixed. Grafting tests to tomatoes indicate that two different viruses may be involved. Symptoms in many cases range from non-emergence, through green-dwarf as described by Milbrath in Oregon, to the stunting and rolling typical of chronic leaf roll. It is worth noting that the Russet Burbank potato grown with these seedlings has acquired only a trace of this disease complex.

Except where close to 100 percent of the plants in a clone were affected by the other diseases listed, roguing was on the basis of leaf-roll infection only. Therefore, the percentage eliminated by these other diseases is considerably lower than the percentage actually affected. In roguing for leaf roll a single current-season infection was sufficient basis for discarding the entire clone. In case of doubt the lot was saved unless tuber characteristics were extremely poor. In Wash. table 1 the crosses producing

Wash. table 1. Crosses with highest percentage of leaf-roll-resistant progeny compared with those having lowest percentage. Prosser, 1949.

Cross No.	Pedigree	Seedlings Tested	Seedlings Saved	Percent saved
		No.	No.	
2299	B 522-33 x (A 792-94)	30	5	16.7
2291	Virgil x (B 522-33)	46	7	16.7
2048	X 1276-48 x (B 24-238)	53	8	15.1
2286	Houma x (B 522-33)	14	2	14.3

Contin. Wash. table 1. Crosses with highest percentage of leaf-roll-resistant progeny compared with those having lowest percentage. Prosser, 1949.

Cross No.	Pedigree	Seedlings Tested	Seedlings Saved	Percent saved
		No.	No.	
1203	B 247-48 selfed	22	3	13.6
1206	B 401-3 selfed	16	2	12.5
2303	X 1276-185 x (B 522-33)	25	3	12.0
2301	X 1276-185 x (X 157-9)	17	2	11.8
2289	Sebago x (B 401-3)	103	0	0
2049	X 1276-48 x Katahdin	72	0	0
2294	B 401-3 x (X 792-94)	68	0	0
2039	X 245-186 x (X 157-9)	53	0	0
2044	I 1241-91 x (X 247-48)	52	0	0
2292	B 401-3 x Katahdin	52	0	0
2284	Erie x (X 247-48)	51	0	0
2235	B 401-3 x Triumf	49	0	0

the highest percentage of surviving progeny are listed, in contrast with an equal number of crosses having the severest elimination. While the populations tested for each cross are rather small for reliable conclusions, the tendency for B 522-33 and X 1276 to appear as parents with the highest percentage of surviving seedlings may be significant. Both of these have been reported as promising material in the Maine program of breeding for leaf-roll resistance. It is clear, however, that with a maximum survival rate of 17 percent after only two seasons of field exposure, none of the crosses can be considered very productive of leaf-roll resistant progeny. There was an average survival rate among all crosses of 3 percent, and including all crosses where they were used as parents the figure for X 1276 and B 522-33 are 3 and 6 percent, respectively.

The severity of the field-exposure test here can be measured by the behavior of Russet Burbank, which is apparently completely susceptible. In 1947 this variety when grown as a check in the exposure plots picked up 65 percent infection as measured by replanting and determining chronic leaf roll. This is practically the same percentage of loss as occurred among the seedlings that year. This year current-season leaf roll was found in 86 percent of the plants of this variety. As a further check on leaf-roll spread this season ten 10-hill lots of Russet Burbank and White Rose were planted at random among the seedling clones. Some leaf roll infection was recorded during the season in every one of these lots

While the data in Wash. table 1 are not very encouraging so far as demonstrating parentage combinations producing high percentages of resistant progeny, other tests indicate that a considerable degree of field resistance does occur in certain seedlings. This is shown in Wash. table 2, which lists a

Wash. table 2. Chronic leaf roll in seedlings replanted from the 1948 exposure tests.

Seedling No.	Tested No.	Chronic leaf roll Pct.
B 754-13	63	50
X 116-74	12	100
X 1276-185	62	13
B 579-16	117	11
B 591-6	19	49
B 96-3	250	100
Calrose	42	2
B 754-16	330	5
B 505-44	238	10
B 579-3	330	2

number of seedling lines that have received more thorough testing. They were replanted from the 1948 test because they gave encouraging results that year. Records of current-season leaf roll in 1949 are not given because at this stage of testing it is considered desirable to use the more accurate chronic leaf roll record as a basis for elimination.

Current-season symptoms in 1949 were noted on most of these, including a rather high number of Calrose, but could not be detected with certainty in the last three listed. These, B 505-44, B 579-3 and B 754-16, are the only ones holding much promise. None appear to be commercially promising in this region but can be added to the list of presumably resistant parents. There is nothing, however, in the immediate parentage of these clones to show a common source of this field resistance.

In view of the limited amount of success so far realized in concentrating leaf roll resistance by the use of field-resistant parents, perhaps more attention might be directed to net-necrosis resistance alone. Since the evidence is that net-necrosis resistance occurs in a much greater proportion of clones than does leaf-roll resistance, the chances for success in this more limited objective should be correspondingly greater. Net necrosis is the major problem as far as leaf roll is concerned with the commercial late potato grower in eastern Washington. If this could be eliminated by breeding, the yield loss due to leaf roll could be controlled by use of disease-free seed stock and by concentrated efforts to prevent early current-season infections. This would not, of course, help the seed producer.

WASHINGTON (Pullman)

C. L. Vincent

Potato variety studies were continued in 1949 for adaptability, yield and leaf roll resistance at the Pullman, Prosser, and Mt. Vernon, Wash. Experiment Stations.

Wash. (Pullman) table 1 gives the results of yields computed in tons per acre. The yields reported do not give a true picture of variety perfor-

Wash. (Pullman) table 1. Yield Test of Potato Varieties, Average of Four Replications at Each Location, 1949

	Place Grown in Washington						Ave. Yield No. 1 Tubers per acre on 3 acres
	Prosser		Mt. Vernon		Pullman		
	Total Yield Per Acre	Yield No. 1 Tubers per A.	Total Yield Per Acre	Yield No. 1 Tubers Per A.	Total Yield Per Acre	Yield No. 1 Tubers Per A.	
	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Ashworth	18.6	18.0	10.7	10.3	23.5	21.0	16.4
Calrose	22.1	20.2	19.2	18.4	21.6	18.0	18.9
Chenango	18.1	17.1	7.8	7.3	28.9	21.3	15.2
Essex	25.4	23.8	14.3	13.5	28.4	25.8	21.0
Glenmeer	8.1	6.8	8.7	8.3	25.4	22.4	12.5
Kennebec	21.5	21.0	10.3	9.9	28.9	26.2	19.0
La Sota	23.5	23.3	9.3	8.8	24.8	23.1	18.4
Madison	11.6	11.2	10.1	9.7	21.3	18.3	13.1
Netted Gem	20.3	19.5	11.1	9.6	20.0	14.7	14.6
Ontario	22.8	21.8	12.4	12.0	25.3	22.2	18.7
Red Warba	18.7	17.8	7.6	6.9	24.6	22.4	15.7
Russet Sebago	19.0	18.4	14.1	13.7	20.4	18.7	16.9
Sebago	18.8	18.0	13.4	12.8	22.5	21.0	17.3
Snowdrift	16.5	14.9	8.7	8.1	19.0	14.2	12.4
Warba	20.0	19.4	8.1	7.7	20.4	17.6	14.9
White Rose	19.2	18.0	15.1	14.4	21.9	19.3	17.2
X 1276-185	17.7	17.3	4.6	4.1	19.5	18.6	13.3

mance since in some cases all of the 25 hills planted did not grow. In computing yield per acre, if only 15 of the 25 hills planted grew, the yield from those hills was used as the basis for determining production. Also, it should be remembered that the varieties were interplanted at regular intervals with Russet Burbank potatoes known to be badly infected with the leaf roll disease.

In 1949, 17 varieties were planted and each was replicated 4 times in 25-hill units. Yields from plots at Mt. Vernon were low due to dry weather At Prosser rill irrigation was practiced, the potatoes being watered at regular intervals to keep the plants in growing condition. At Pullman the potato plots were watered by sprinkling 3 times during the grower season.

The highest-yielding varieties, taking the average yield of the three sections, were Essex, Kennebec (based on a few plants in each location), Calrose, LaSota, Ontario, Sebago, White Rose, and Russet Sebago.

WEST VIRGINIA

K. C. Westover

With the exception of a small isolated planting in the higher altitudes at Bismark, W. Va., this season's work with potatoes was carried on at the Reedsville Experiment Farm. The Bismark planting consisted of 35 stocks, most of them tuber-indexed, which included those used in the replicated trials and some of those of particular interest used in the 50-foot row planting. The planting was frequently rogued during the season in order to provide as clean planting material as possible for 1950. In general, weather conditions for the northern part of the State through the season were exceptionally favorable for potatoes. Neither early nor late blight appeared in the plantings even though there were severe outbreaks in the area.

At Reedsville 8 family lines, totaling 1,147 sets, received from Beltsville were planted. From these 102 selections were made on the basis of plant and tuber type, vigor, and general adaptability. From the 96 10-hill units, all of which were selections from family lines received last season from Beltsville, only 18 were held over for this coming season. The 66 seedstocks planted in the 50-foot row trials were mostly selections (47) made here from family lines received from Beltsville or were samples from selections made in Maine and sent from Beltsville. The remaining stocks in this planting were originally from North Dakota, Pennsylvania, New York, and Minnesota. Several of them have been under observation here for several years. Nineteen of these have been retained for use this coming season. Twenty-five seedstocks were planted in the replicated trials. Of these 12 included the newer more widely established varieties, as well as those recently named, which from use in previous tests were believed to be well-adapted. The remaining 13 stocks were selections made here over a period of several years. Yield comparisons from this planting are given in the West Virginia table 1.

In the 50-foot row planting B 929-10 (W. Va.), Dakota Chief, ND 148-84, BN-5 (Pa.), X 484-1 (USDA) and ND 530 grew vigorously, were medium late to late in maturity and gave exceptionally heavy yields of desirable type tubers.

As in the past, the oldest of the well-established standard varieties have yielded best even though the order with respect to yield changes from year to year. As shown in the attached table, Kennebec, grown here for the fourth season, gave outstanding yields and is apparently well adapted to this area. Although its tubers are reported elsewhere as being smooth and attractive, here the larger tubers are generally somewhat irregular in shape. B 137-11 and B 434-127, B 61-3 and B 76-43, and K-5 (ND) are again high-yielding, medium late to late stocks having desirable plant and tuber characteristics. These B stocks in past trials have shown resistance to late blight, and in 1950 they and the other selections made from the 50-foot row and plantings replicated trials will be tested by the Department of Plant Pathology for disease resistance. It is also planned to use these, together with some of the popular varieties, in plantings out in the State to determine their general adaptability and value.

With the arrival of Dr. Callegly in pathology, it begins to look as if we can make progress in testing for disease resistance.

West Va. table 1. Yields in bushels per acre from 1949 replicated potato variety trials, Reedsville Experiment Farm, Reedsville, W. Va.

Variety	Source	No. 1's	Total	Difference	Percent off-grade	Rank
Pontiac	Michigan Cert.	809.	843	34	4.0	4
Kennebec	Tuber Indexed	690	716	26	3.6	3
Sebago	Tuber Indexed	642	669	27	4.0	4
Katahdin	Canadian Cert.	610	628	18	2.9	1
Menominee	Michigan Cert.	609	639	31	4.8	5
Sebago	Canadian Cert.	576	595	19	3.2	2
Cobbler	Canadian Cert.	561	609	48	7.9	1
B 137-11	Tuber Indexed	558	595	37	6.2	11
Houma	Canadian Cert.	554	588	34	5.7	7
Chippewa	Canadian Cert.	542	573	31	5.8	8
K-5 (ND)	Tuber Indexed	538	577	39	6.7	12
B 61-3	Tuber Indexed	526	571	45	7.9	14
Fillmore	Tuber Indexed	517	573	55	9.7	16
B 606-77	Tuber Indexed	513	547	33	6.1	10
B 76-43	Tuber Indexed	465	494	30	6.0	9
B 604-10	Tuber Indexed	461	512	51	10.0	17
Ontario	New York Cert.	425	468	43	9.2	15
B 178-3	Tuber Indexed	405	451	46	10.1	18
B 434-127	Tuber Indexed	397	427	31	7.2	13
Cobbler	Tuber Indexed	384	430	46	10.7	20
B 591-47	Tuber Indexed	383	449	67	14.8	22
Snowdrift	Tuber Indexed	371	434	63	14.5	21
B 76-23	Tuber Indexed	337	358	21	5.8	8
B 434-158	Tuber Indexed	334	351	17	5.0	6
B 608-9	Tuber Indexed	308	343	35	10.3	19
Least significant difference at 5% level		131.3	178.5			
Least significant difference at 1% level		136.4	185.4			

Tuber indexed stocks were carried by this station

WISCONSIN

NORTH-CENTRAL REGIONAL POTATO INTRODUCTION STATION

Reported by

R. W. Hougas
located at
Wis. Agr. Expt. Sta., Madison, Wis.

(Cooperative project of the North-Central States and U.S.D.A., Division of Plant Exploration and Introduction)

The following Solanum introductions are being maintained and increased at the North-Central Regional Potato Introduction Station, Sturgeon Bay, Wisconsin.

Introductions from Brazil

Fifty Brazilian potato introductions were indexed for disease and increased in the field during the 1949 growing season. A preliminary evaluation of this material as to tuber and seed set, plant habit and maturity was made in 1949. Thirty to sixty pounds of tubers were harvested from each introduction during the current year. This tuber increase is available for distribution.

Introductions from Mexico

One hundred eight stocks of Solanum tubers and 61 stocks of Solanum seed, collected by Dr. D. S. Correll in Mexico, were grown in the field during the 1949 growing season. Tuber and seed increases were harvested and are available for distribution. Some species found in this collection are short-day plants and fail to tuberize under long-day growing conditions. A total of 31 of these short-day introductions, which failed to tuberize in the field, are being propagated under short-day conditions in the greenhouse. The taxonomic study of this collection is being conducted by Dr. D. S. Correll, Division of Plant Exploration and Introduction. A preliminary cytological investigation of this material has been undertaken by Dr. J. R. Beaudry, Wisconsin Alumni Research Foundation research associate. The Correll collection of wild potatoes is comprised of many different species, most of which are known, while a few have not yet been described. Some of the species found in the Correll collection are Solanum andigenum, S. bulbocastanum, S. cardiophyllum, S. demissum, S. longipedicellatum, S. polyadenium, S. semidemissum, S. stoloniferum, and S. verrucosum.

Forty-one introductions of this collection were undamaged by a field frost that killed all standard varieties of the common potato. It was noted that most of these frost-resistant lines were Solanum demissum.

Resistance to the X and Y viruses and possible resistance to the leaf roll virus of common potato has been found among the Correll collection b Dr. Donald Reddick of Cornell University. High resistance of the diploid species Solanum polyadenium to insect attack has been reported by Dr. J. P. Sleesman of Ohio State University.

Introductions from Europe

Twenty-eight introductions of Solanum seed were received early in 1949 from Dr. Wilhelm Rudorf, Director of the Max-Planck Institute of west Germany. A portion of this seed, originally received by Dr. F. J. Stevenson, Plant Industry Station, Beltsville, Maryland, was also distributed to Dr. Donald Reddick, Cornell Experiment Station, Ithaca, New York. Seed of each of these introductions was planted in the greenhouse in July and the tuber crop harvested in December. These tuber lines will be planted in the field in 1950 for increase and preliminary evaluation.

Forty-seven European tuber introductions have recently been received from the Plant Quarantine Station, Glenn Dale, Maryland. These introductions are varieties and breeding stocks reported to carry resistance to the A, X, Y, and leaf roll viruses, late blight, and Colorado potato beetle injury. Several of these stocks have been developed through interspecific hybridization at some of the leading European potato research laboratories. The list that follows shows the number of introductions by countries: Germany, 18; Holland, 6; Ireland, 1; Norway, 14; Scotland, 8. Some of these stocks are now being increased in the greenhouse. All of this material will be grown in the field at Sturgeon Bay during 1950.

Other Introductions

Introductions from four other countries have been received. These introductions, listed by country, are being increased for distribution: Peru, 5; Argentina, 1; India, 1; Canada, 1.

Disease Control Measures

Disease control measures have been emphasized in the propagation of these Solanum introductions. Tubers were indexed for disease in the greenhouse, planted in isolated plots on a tuber-unit basis in the field, and rogued for disease throughout the season. A rigorous spray program for the control of insects and diseases was practiced throughout the growing season. The control of both insects and diseases was most satisfactory. Parathion, newly released insecticide, in combination with DDT, gave remarkable control of potato insects.

Distribution

The following research laboratories have received selections (seeds or tubers) of the collections now being maintained at the North-Central

Potato Introduction Station:

Seed:

Reiner Bonde, Maine Agricultural Experiment Sta., Orono, Maine
Forman T. McLean, Virginia Truck Crop Expt. Sta., Norfolk, Va.
Donald Reddick, N. Y. Agricultural Expt. Sta., Ithaca, N. Y.
F. J. Stevenson, Plant Industry Station, Beltsville, Md.

Tubers:

L. W. Nielsen, University of N. C., Raleigh, N. C.
W. A. Riedl, University of Wyoming, Laramie, Wyoming
G. H. Rieman, Wis. Agr. Expt. Sta., Madison, Wis.
J. P. Sleesman, Ohio Agr. Expt. Sta., Wooster, Ohio

An inventory of the available tuber and seed s tocks has been prepared. This inventory, which lists each introduction by number, includes the evaluation data available to date, such as species, chromosome number, general horticultural characteristics, and resistance to insects and diseases. This inventory will be distributed to potato breeders, pathologists, and other interested investigators during the winter of 1950.

WISCONSIN

G. H. Rieman, R. W. Hougas and G. W. Stokes

Breeding for resistance to scab is of greater general interest than any other potato improvement problem in Wisconsin and throughout the nation. The new scab-resistant varieties Menominee, Ontario, Seneca, Cayuga and Yampa, introduced by the various agricultural experiment stations and U.S.D.A., are all lacking in one or more important horticultural characters. For this reason they are not grown extensively in production regions where common scab is troublesome. However, these new scab-resistant varieties are useful in breeding programs where it appears desirable to introduce at least partially unrelated scab-resistant lines.

Practically all of the scab-resistant stocks used in potato-breeding programs in this country have been developed from the three exceptionally high scab-resistant European varieties Hindenburg, Jubel, and Arnica. Other parents possessing intermediate resistance to scab have been used in the Wisconsin breeding program, but they have not produced the high levels of resistance obtained from the three European varieties mentioned. The results obtained from Hindenburg, Jubel, and Arnia in extensive breeding operations have been disappointing. These three varieties possess the following undesirable horticultural characters which are readily transmitted to their offspring: (1) Late maturity; (2) poor cooking quality (low specific gravity and internal discoloration); and (3) poor market quality (shape, size and color).

The inheritance of these undesirable horticultural characters is extremely complex. The following example of strain building is now being used to develop desirable breeding stocks:

First cycle	6.38 - 119	Cobbler x Hindenburg
	13.38 - 253	Chippewa x Hindenburg
Second cycle	302.41 - 6	6.38 - 119 x 13.38 - 253
Third cycle	1050.47	302.41 - 6 x Ontario (Jubel x 44537)

The two single cross selections 6 - 119 and 13 - 253, made in 1938, were intermediate for maturity, resistance to scab, and tuber type. The second cycle selection 302.6, obtained in 1941 by crossing the two intermediate single cross selections, also proved to be intermediate for maturity and resistance to scab, while the tuber type was superior to either single cross parent. Approximately 50 second-cycle selections similar in origin to 302 - 6 remained in 1946 out of a total of about 10,000 seedlings started in 1941. Five of the best second-cycle selections were increased in 1947 and tested for yielding ability and horticultural characters in replicated plots.

The breeding value of 7 of the most promising second-cycle selections, including 302 - 6, was determined by testing selfed and outcrossed progenies. Six of these selections proved to be homozygous for late maturity. Selection 302 - 6 produced 1 to 2 percent early and medium-early plants in selfed progenies. When this seedling was crossed with the late-maturing scab-resistant variety Menominee, only an occasional early-maturing plant was observed in the resulting progeny. Over 4,800

seedlings from this combination have been studied during the past 4 years. Four of the best third-cycle selections in this group were increased in 1947 and tested for yielding ability and horticultural characters in replicated plots. From this cross 36 selections were maintained in the seed-increase plots and tested for resistance to scab. The following maturity readings and selections were made:

	Early	Medium	Medium-late	Late
Total	0	5	6	25
Selected	-	1	1	7

A higher percentage of early-maturing plants were found in the progenies obtained from crossing seedling 302 - 6 with the new scab-resistant Ontario variety. Approximately 6,000 seedlings from this combination were started in the greenhouse during the summer and fall of 1947. They were grown in the field the following year, and 708 selections were made. Selection for early maturity and desirable tuber type was emphasized. This group of seedlings was maintained in the seed-increase plots at Rhinelander and tested for resistance to scab in 2 replicated plantings in the scab nursery at Antigo during the current season. The following maturity readings and selections were made:

	Early	Medium	Medium-late	Late
Total	43	115	145	406
Selected	35	28	13	14

The results obtained from this group of third-cycle seedlings have been most encouraging up to this point. It has not been difficult to recover a large number of seedlings possessing the high resistance to scab found in the parental European varieties combined with satisfactory tuber type. Furthermore, this combination of characters appears to be associated occasionally with early maturity. Preliminary evidence of these favorable combinations became available a year ago, and an additional population of about 8,000 seedlings from the same cross was started in the greenhouse. They were planted in a seed field during the current year. Growth appeared to be normal throughout the season and an average yield of tubers was produced. A high incidence of severe physiological internal tuber necrosis was observed in these stocks at harvesttime. The tubers from 1,773 seedlings were examined in the field. Of this total, 1,695 exhibited varying amounts of internal tubers necrosis, and only 78 appeared to be normal. The seedlings that produced normal tubers were without exception late in maturity. These results indicate that the breeding value of the Ontario variety and selection 302-6 is limited. Little is known concerning the inheritance of this defect.

Non-parasitic internal tuber necrosis has been observed in varying amounts during the past 12 years in the European scab-resistant varieties Hindenburg, Jubel, and Arnica and in some of the breeding stocks related to these three varieties. It has also been observed in many other unrelated potato varieties and strains. Selections showing moderate to severe amounts of this defect have been discarded in the breeding program. The new Ontario variety produced normal tubers

in test plantings during the years 1945 to 1948. During this period it became recognized as the best of the new scab-resistant varieties in Wisconsin and in other potato-producing States. Modest commercial acreages of Ontario potatoes were produced in various parts of the State in 1949. Severe internal tuber necrosis developed in some of these commercial plantings. Additional tests will be necessary to evaluate the Ontario variety for commercial production in Wisconsin.

Non-parasitic internal tuber necrosis has appeared sporadically in various potato varieties grown on the light sandy soils of central Wisconsin. It appears to be most troublesome in this area during seasons of hot dry weather in certain varieties like Katahdin and Russet Rural. The malady has been of little importance in other potato-producing areas of the State during the past 10 years.

Breeding for resistance to tuber necrosis of this kind will be difficult, since it does not develop each year under field conditions. An attempt will be made to thoroughly test the susceptibility to physiological internal tuber necrosis of all parental stocks used in the potato-breeding program.

WYOMING

Wm. A. Riedl, G. H. Starr, and Clarence M. Rincker

The work at the Wyoming Experiment Station in 1949 consisted of testing for ring-rot resistance and scab resistance and the testing of commercial varieties and promising seedlings at three stations in the State.

Ring-rot Resistance

Eight ring-rot-resistant varieties and Bliss Triumph were inoculated with ring-rot bacteria obtained from susceptible varieties. These were planted in 10-hill rows, replicated 4 times. A similar test was made on the same varieties except that they were inoculated with bacteria obtained from resistant varieties. The percentage of plants showing vine symptoms is shown in Wyoming table 1.

Wyoming table 2 shows a summary of results for 4 years on the testing of inoculum from susceptible varieties and inoculum from resistant varieties.

Wyoming table 1. Percentage of plants showing ring-rot symptoms when inoculated with bacteria from susceptible and resistant varieties.

Varieties	Inoculum from	
	Susceptible Varieties	Resistant Varieties
	%	%
Bliss Triumph	97	94
Average of 8 resistant varieties	24*	21*

* Includes plants with questionable ring-rot symptoms. The tubers from all of the plants have been saved and will be checked for ring-rot infection.

Wyoming table 2. Four-year summary giving percentage of plants showing ring-rot symptoms when inoculated with inoculum from susceptible varieties and from resistant varieties.

Varieties	Inoculum from	
	Susceptible Varieties	Resistant Varieties
	%	%
Bliss Triumph		
1946	97	91
1947	100	100
1948	73	76
1949	97	94
Average	91.8	90.2

Continued Wyoming table 2.

Varieties	Inoculum from Susceptible Varieties	Inoculum from Resistant Varieties
	%	%
Average of Resistant Varieties		
1946	14.8	20.8
1947	3.0	3.0
1948	7.0	5.0
1949	24.0	21.0
Average	12.2	12.2

These results indicate that there is no significant difference in the virulence between ring-rot bacteria obtained from susceptible varieties and those obtained from resistant varieties, since the plants inoculated with these two sources of the organism produced approximately equal percentages of ring-rot symptoms. This will conclude our work on this phase of ring-rot investigations.

In another test 56 new potato seedlings were tested for ring-rot resistance in 10-hill rows. Four of these showed no ring-rot symptoms. Three of the four seedlings were introductions from Brazil. These seedlings were saved and will be tested again next year.

Another experiment of a similar nature was conducted in 1949 using four potato varieties as sources of inocula to inoculate healthy potatoes of these four varieties in all combinations. These varieties were as follows: Teton, resistant; Bliss Triumph, susceptible, and Red McClure and Burbank, intermediate. The tubers were inoculated by leaving cut seed-pieces in the bacterial suspension for 60 minutes. In addition to the percentage of ring rot, an index figure was used to portray the relative development or progress of symptoms in the plant. If the plants showed no symptoms they were given a reading of 0, and if plants were killed, a reading of 10. The results may be seen in Wyoming table 3.

This test shows that in 1949 the Teton inoculum caused the most ring rot (percentage) and the most severe symptoms, followed in turn by Red McClure, Burbank, and Bliss Triumph. During the other 3 years that this test has been conducted, other varieties have exchanged places with Teton, as causing the most ring rot, so the differences between variety-inoculum probably are not significant.

Another experiment on the dilution of the ring-rot inoculum has been conducted in which the Bliss Triumph variety was inoculated with a definite amount of inoculum (7 grams of ooze to 250 c.c. distilled water) diluted as follows: 1:10, 1:100, 1:1,000, 1:10,000, 1:100,000 and 1:1,000,000. Where the bacterial suspension was 1:1,000, or more dilute, no plant symptoms were seen the first year. Tubers from the higher dilution-series (where no ring-rot symptoms were found) have been saved for

Wyoming table 3. Four potato varieties inoculated in all combinations with inoculum from each of these varieties and planted in 10-hill plots (two replications) at the Agronomy Farm near Laramie in 1949. (Inspection for final plant symptoms on September 12, 1949).

Variety from which inoculum was taken	Variety Inoculated	Ring rot plant symptoms	Index figure* for ring rot symptoms
		Pct.	
Bliss Triumph	Bliss Triumph	80	4.4
Burbank	" "	100	7.2
Red McClure	" "	95	7.0
Teton	" "	95	7.0
Bliss Triumph	Burbank	74	3.9
Burbank	"	58	2.9
Red McClure	"	88	4.7
Teton	"	89	4.4
Bliss Triumph	Red McClure	79	2.8
Burbank	" "	94	3.2
Red McClure	" "	89	3.2
Teton	" "	95	4.2
Bliss Triumph	Teton	0	0
Burbank	"	0	0
Red McClure	"	0	0
Teton	"	0	0
Bliss Triumph	Bliss Triumph, Burbank, & Red McClure.	78 (Av.)	3.7 (Av.)
Burbank	" " " "	84 (")	4.4 "
Red McClure	" " " "	91 "	5.0 "
Teton	" " " "	93 "	5.2 "
B.T.,Burb.,R.McC.,& Teton	Bliss Triumph	92 (Av.)	6.4 (Av.)
" " " " " " "	Burbank	77 "	4.0 "
" " " " " " "	Red McClure	89 "	3.3 "
" " " " " " "	Teton	0	0

*Average development of plant symptoms: 0 = no ring rot evident; 10 = plant entirely killed.

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replanting in future years to determine how long it will take plant symptoms to appear in the various dilution-series. This experiment now has been conducted for 4 years and ring-rot symptoms already have appeared in some of the dilutions above 1:1,000.

Scab Resistance

This test was conducted again at the Agronomy Farm near Laramie and included 32 lines supplied by Dr. L. A. Schaal, U.S.D.A., and 21 lines saved from the 1948 test at Laramie. These seedlings were planted in 5-hill units, replicated 3 times. Bliss Triumph check units were randomized throughout the plot.

The conditions apparently were not the most favorable for scab development, as both the scab severity and prevalence were the lightest they have been since the scab testing began at Laramie. However, the following units were saved for further testing by virtue of their type and yield, and scab resistance: These lines were as follows: M63-11 (W.2447A), B 395-13 (W.2418), B 395-5 (W.2417), 627-8 (W.461), 6317 (W.2419), 6324 (W.2420), 6330 (W.2421), 6332 (W.2422), 6403 (W.2424), 7137 (W.2425), 7287 (W.2426), 7308 (W.2427), 7312 (W.2428), 7364 (W.2429), 7702 (W.2434), 7803 (W.2431), 7846 (W.2438), 8043 (W.2436), 8053 (W.2437), 9727 (W.2439), 9741 (W.2441), 9760 (W.2442), 9775 (W.2443), 10185 (W.2447), 6992 (W.2162), 7285 (W.2142), Ia. 44-33-2 (W.2357), Ia. 116-13 (W.2129), 104-2 (W.2140), 6332 (W.2138), 7918 (W.2191), 6364 (W.2121), 7744(W.2183), 4700 (W.2323), 10184 (W.2354), 528-118 (W.471) and Wyoming hybrid B. T. x 471.

Variety Yield Trials

Variety yield trials were conducted at Laramie, Powell, and Afton. At Laramie, 16 varieties and 2 promising seedlings were tested in 60-hill rows, replicated 4 times. At Powell, 12 varieties were planted in 100-foot rows, replicated 4 times. At Afton, 8 varieties were planted in 60-hill rows, replicated 4 times.

Seedling Yield Trial

Forty-seven promising seedlings were grown in a preliminary yield trial, which consisted of 60-hill rows, replicated 2 times. Of these seedlings 29 were saved for further testing.

Seedling Increase

At the Laramie Station, 13 seedling varieties were planted in the increase trial. Eight of these were saved for further increase. Twelve varieties including 10 seedling varieties were increased at Torrington.

Seedling Observational Trial

Sixty-eight seedlings were planted in 4-hill rows for observation. Thirty-seven were saved for further observation.